THE MODEL ENGINEER

Christmas Number

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THE MODEL ENGINEER

EVERY THURSDAY

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CONTENTS

Our Cover Picture

An old theme in a new guise is, perhaps, the best description of the scene depicted on this week's cover. Several of our contributors are as expert with colours and brushes as they are with the more normal contents of a workshop, and this week Mr. Terry Aspin, whom we know as an artist by profession and a model engineer by inclination, proves himself to be one of these prolific and versatile people. Judging by the locomotive, St. Nicholas has come by way of the Garden of England and presumably called at a well-known hacienda in the neighbourhood of Purley ! His load, however, suggests other possibilities as well, and we hope that the items seen in it will find their way into the workshops of readers all over the world. Be this as it may, our cover symbolises the feelings of good will, friendship and happiness that moved us to produce it.

SMOKE RINGS

Greetings

ONCE MORE, the time has come for us to present our readers with a special Christmas issue of THE MODEL ENGINEER, and we do so with our usual warmest greetings and cordial wishes. We hope you will like it, for we have tried to find some cheery contributions which will help you to enjoy the relaxation afforded by the Festive Season. At the same time, we have included something of the more normal kind, so as to avoid causing any hold-up in those workshops where jobs are due to be replaced by new ones, or are keeping in step with published instructions.

Once again, also, we are pleased to direct special attention to the advertisements; they may be the means of helping to solve some little difficulties in the matter of Christmas presents, and our advertisers, collectively, can satisfy many of the needs of our readers. This is one of the reasons why our Christmas number is published about two weeks ahead of Christmas Day. After that date, and possibly with new items added to the equipment, our workshops resume activities with a vigour enhanced by the thought that the longer days are already at hand and that new model requires a lot to be done to it before it will be ready for the track, the pond or the air, as the case may be. But no matter what it is, we wish it speedy completion and successful trials. And then let us hear about it !

R.S.A. Bicentenary Competition

THE ROYAL SOCIETY OF ARTS will reach its bicentenary in March, 1954, and with this in mind, and in addition to various customary forms of celebration, a competition is being arranged and will focus attention on the future. The Society is offering prizes totalling £500, the largest being £250, for conceptions of life on this planet in the year 2000. Forecasts, in visual or written form, are invited of the future developments which may be looked for in some particular aspect of life related to Arts, Manufactures and Commerce, the field of the Society as defined in its original title. For example, a competitor might give his ideas of what transport, housing and food or clothing may be like in 2000.

If any reader has original notions concerning these subjects, he should write to the Secretary, Royal Society of Arts, John Adam Street, London, W.C.2, for full terms, conditions and registration forms. The last-named must be completed and returned with an entry fee of 1s. by February 15th, 1954, and the actual competitive material submitted by June 30th, 1954.

Burrell's " Gladiator "

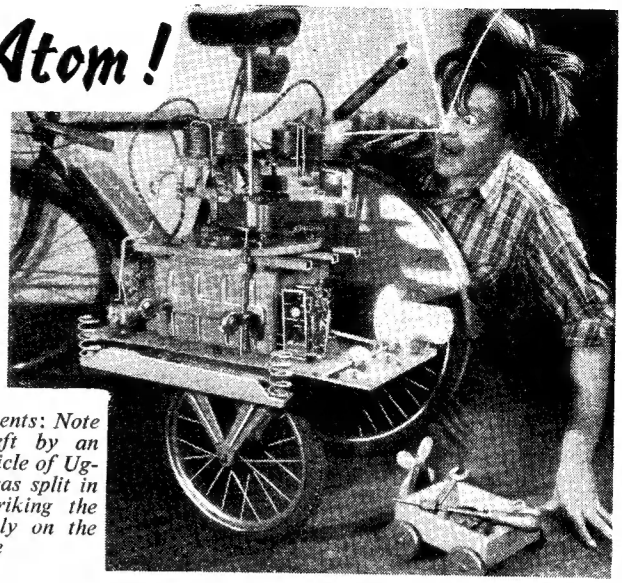
MUCH SATISFACTION has been aroused by the news that a fine Burrell showman's road locomotive, *Gladiator*, after lying idle and neglected for years, has been privately bought and is to be well cared for in future. She has been bought by a small " syndicate " of four enthusiasts headed by Mr. A. E. Pethwick and his son Mr. D. Pethwick ; the other two are Messrs. P. J. Tambling and D. B. Webb. All belong to Redruth, Cornwall.

Gladiator was Burrell's No. 3159 and was completed on December 12th, 1909 ; she originally belonged to Anderton and Rowland, passing later into the hands of T. Whitelegg. For more than 30 years she hauled trains of showman's equipment from place to place in the West Country ; but, since 1941, she has stood, silent and all but forgotten, in a yard in Exeter. But at the time of her " rescue " by Mr. Pethwick and his little band of helpers, she was found to be sound and roadworthy. A boiler surveyor's certificate and a Road Fund licence were obtained, and she was able to travel under her own steam to her new home at Redruth, 100 miles away.

Mudguards and Atom!

THE WORLD'S FIRST ATOMIC BICYCLE

By Michael Oxley



Final adjustments: Note the track left by an escaping particle of Ughium which has split in two after striking the author forcibly on the nose

SOME readers may recall that, a long time ago, I promised to give an account of a few experiments in nuclear fission and the application of atomic power to bicycle propulsion. This suggestion seemed to cause a certain amount of disquiet, and I was overwhelmed with letters begging me not to, one or two going so far as to hint that in future I should stick to clockwork. I admit that with one tiny steam engine, I had managed to wreck the workshop, demolish the back garden, demoralise the whole neighbourhood and pierce the sound barrier, causing three distinct supersonic bangs; but these were only teething troubles, inseparable from the development of a new engine. It was the same with Watt. As a matter of fact no untoward results have attended my atomic researches so far, except on one occasion when an errant proton volatilised the gas 'cooker before I could neutralise it with carbolic. I am giving the machine its first full power test tonight.

(EDITOR'S NOTE: *This is as far as Mr. Oxley's manuscript goes, but extensive search in the smoking ruins of his workshop has revealed the following papers which we think may be of more general interest. They are concerned with an entirely different subject, but after all, how many of us have wives who would stand for an* 800 *ton cyclatron permanently erected in the kitchen* ?)

ABOUT TURNING

Making the Most of Your Lathe

All of us have lathes, or would like to have them, and although much has been written about their use, most of it is theoretical stuff of little practical value. I have long felt the urge to give some hints and advice on the art of turning, most of which I have acquired the hard way.

Many of our readers will wake up on Christmas morning apparently paralysed from the knees down. After struggling vainly for a few minutes, they will realise that this is not due to any overnight affliction. but is caused by a huge packing case delicately poised across the foot of the bed. Closer examination will reveal that this packing case contains a brand new Myford Super 7, complete with powerful motor and all accessories, a present from their loving wives, in return for the pair of seamless nylons which they hurriedly bought at about a quarter-past ten the previous evening. These people can get cracking right away, but some of us are less fortunate, and may have to make do with a second-hand machine; so let us consider what the lathe is and what to look for when purchasing one.

Basically, a lathe consists of a roughly shaped block of metal known as the bed to which all the other bits are attached. Some of the bits should be fixed firmly, others may be slid about, and it is most important to choose a lathe which has the right bits fixed and the right bits left loose. The bed is usually decorated with a tasteful pattern of hammer-marks, saw-cuts and drill holes, and quite a lot may be deduced about the character of the previous owner by a close examination of his lathe bed. A bed covered with a network of tiny saw-cuts and holes shows that he was a niggling, fiddly, spectacles-on-end-of-nose type, probably addicted to making models of bicycles one hundredth full size complete with working roller chain. On the other hand, if the bed is entirely covered with masses of huge dents and hammer blows at least a quarter-of-an-inch deep, that is a sure sign he was one of the jolly, swashbuckling, have-a-bash-even-if-it-kills-me chaps.

To get back to the lathe, you may find it has what is known as a gap bed. This means it has a recess at one end which is very useful, as cups of tea may be placed there without disturbing the work in progress. The next two most important parts—the headstock and the tailstock, will be found one at each end of the bed. Lathes which have them both at the same end should be instantly rejected. They are quite useless to the model engineer, who is rarely called upon to machine a job which has its opposite faces on the same side. The headstock may contain bearings, if so they should be examined very carefully before buying the lathe. Insert the tips of the fingers in the annular space between the mandrel and the part it turns round in, and cautiously feel round. Things to look for are odd pieces of brass, bent coins, compressed milk-bottle-tops and anything else that may have been hurriedly crammed in to act as packing. If the lathe should have split bearings, there is no need to worry unduly; they can easily be welded up. In theory, the headstock and tailstock should point straight at each other, but in the author's experience this does not happen very often. The best way to check it is to insert the lathe centres and then bring the tailstock up towards the headstock.

The points will probably have nothing to do with each other at all; if this is the case, take them out and replace them with the blunt end outwards. If they still miss each other, it is very doubtful whether the machine is capable of turning out any really accurate work.

Of course, you can make a lathe; the only snag is that before you can do this you must first obtain another lathe to make it on. All lathes have to be made on other lathes. How the first lathe was made is one of the great unsolved mysteries of engineering, like how they built the pyramids, and what L.B.S.C. does with his weeny injectors.

Before describing any actual turning operations, some mention must be made of chucks and lathe tools. Chucks are the things which lathes are invariably supplied without. You can buy a lathe without a 3-jaw chuck or one without a 4-jaw chuck, but if you can afford it get one without both, they are really indispensable. This also applies to lathe tools. These are the bits which actually do things to the lump of metal you are turning, so it is no use starting without a large supply of them, and they must be correctly ground and inserted in the toolpost, one at a time, with the sharp end to the middle. A few of the more useful shapes are shown in Fig. 1. *A* and *B* are right- and left-handed digging-in tools. They are usually used for the first carefree assault on the work in hand. *C* is a round-nosed smooger, used for removing some of the horrible grooves and gashes made by the digging-in tool. *D* is a tool of the author's own design, it is intended for cutting right- and left-handed threads simultaneously. *E* is a profile or form tool. This is extremely useful if you should ever happen to want to turn something shaped like *F*, otherwise it is a total loss. If you can afford them, it is a good idea to buy some tipped tools. The body of these is formed of steel, but the actual cutting edge is a tiny bit of some very hard substance, such as household coal, and their chief merit is that they may be run frequently into the revolving chuck-jaws without damage. A good tipped-tool will completely remove nine or ten sets of chuck jaws before it even needs touching up.

Some turners keep their machines submerged in a revolting fluid known as cutting oil or coolant, the real purpose of which is to dissolve the swarf as fast as it is formed, and so save a lot of tiresome sweeping up. It can be obtained in little bottles, or a handy mixture may be made at home by taking an old earthenware pot and putting in 2 quarts of phosphoric acid, 4 gallons of corrosive sublimate B.P., 3 pounds of used gear-box sludge, and boiling together for eight hours. Throw in a handful of silica carbide and allow to seethe. Up to one per cent. of aromatic oil of cloves may be added, if liked. A copious supply of this liquid squirted on to the work will completely eliminate the swarf. It should first be diluted with old tea, otherwise there is a grave danger that it will completely eliminate the lathe as well. It should not be drunk.

Fig. 1.

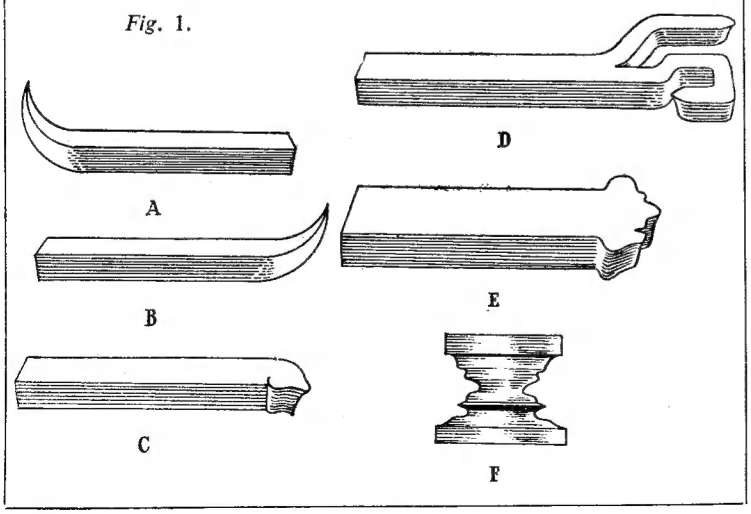
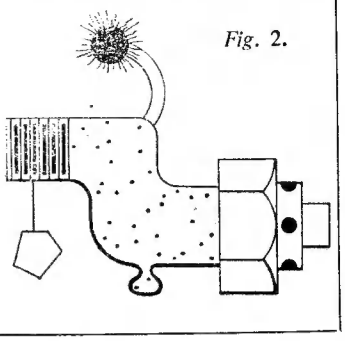


Fig. 2.



We will assume that we have now got our lathe, tools and equipment and are ready to start work, so let us take some simple job and follow it through stage by stage. A very dear friend, we will suppose, has begged us to make him a new thrupple nut for his lawn mower, to replace one damaged by running into a mangle hidden in the grass. First of all we take up the old thrupple nut and try to imagine what it must have looked like before the accident, then, seizing a pencil, we carefully draw it out full size (Fig. 2). Next, we obtain a piece of Admiralty bronze, an inch or two larger in all directions than the finished nut, to allow for any small errors, and grip it firmly in the chuck. We clamp a suitable tool in the toolpost, set the lathe in motion and our big moment has come at last. We are about to take our first cut ! We shall now see a practical realisation of that ancient problem first posed by Archimedes one night while waiting for his bath to fill, namely, what happens when an immovable object meets an irresistible force. Grasp a handle—any handle will do to start with—and turn it rapidly. If nothing much happens, try turning it the other way. Turn another handle. Turn all the handles in sight. If you can seize a handle with each hand and turn them both at once in opposite directions so much the better, this looks really professional. Keep spinning them round; sooner or later the tool is bound to run into the revolving metal, and you will actually have started turning. Ease up a bit on the handles then and watch carefully what happens. If the metal peels off in great thick red-hot chunks, with a good deal of smoke, you are taking too much off at one go. On the other hand, if the metal merely becomes highly polished without getting any smaller, you have probably got the tool in upside down. Rectify these errors

and keep hacking away until the piece of metal is tortured into a shape which looks vaguely like the drawing. If it obstinately refuses to do this, the only thing to do is to make another drawing which looks vaguely like the piece of metal. We are now ready to attempt the next operation, which is screwcutting.

Although screwcutting is often regarded as an advanced—even esoteric—form of lathe-work, demanding an iron nerve and a knowledge of higher mathematics, there is no reason why the beginner should not try his hand at it, for it often leads to some surprising and interesting results. External screw threads are really no different from normal turning marks, except that they are properly spaced out to fit in the nuts. This spacing out is done by forcing the tool along the work by means of a leadscrew, which is driven off the mandrel through a complicated system of gears, known as change wheels, because it makes a change when you get the right ones on. A complete set of these gears, containing all the sizes you will never want, should be supplied with the lathe. When new, the teeth are pointed in shape, and are known as involute teeth. When they have been used for some time, the points will wear off, and they are then called stub teeth. After a further period of use, even these will go, and the whole assembly becomes a friction drive. It is obvious that the number of teeth per inch cut depends on the number of teeth on the wheels, so it is no good sticking any old one on at random; you stand about as much chance of getting it right that way as you do of getting the treble chance up. You must work it out mathematically, there is a simple formula which makes it quite easy, *viz* ;—

$$\frac{h.t.l.b.}{d} \times \frac{t.p.i.}{\pi R^2}$$

where R = 3.149287149
t.p.i. = threads per inch
d = diameter.
h.t.l.b. = high tide at London Bridge.
and viz: = viz:

Our thrupple nut will probably be screwed $\frac{5}{8}$ B.S.L.M. (British Standard Lawn Mower) which is 11 3/9 threads per inch; so, applying this to the formula, we get:—

$$\frac{8.45 \text{ p.m.}}{0.625} \times \frac{102}{9} \times \frac{1}{3.149287149^2} = \frac{273}{1\frac{1}{2}}$$

Thus, we need to put a 273 tooth wheel on the mandrel and a $1\frac{1}{2}$ tooth wheel on the leadscrew. If you haven't got a wheel with 273 teeth, you can use one with 275, simply take a hammer and chisel and knock off any two. Readers who do not possess a $1\frac{1}{2}$ tooth wheel either, are certainly in a bad way; they should write to me personally, as I have many wheels with $1\frac{1}{2}$ teeth, or even less. Once you have got the right wheels fitted, the actual screwcutting operation is quite easy. Simply put a sharply pointed tool in the lathe, and let it plough its way along. Do not worry about it going too far along the work; as the tool reaches the shoulder it will automatically snap off.

Having finished screwcutting our thrupple nut, all that remains to be done is to part it off, and believe me, this is where we are really up against it. Trouble looms; parting off is so fraught with peril, and the chances of success are so remote, that it is really better not to attempt it at all. Of course it is rather awkward when you have turned, say, a pair of steam-chests, a thrupple nut or two, an ornamental candle-snuffer, and a couple of feed-pumps, to have them permanently joined together like a small totem pole. It rather limits their usefulness, so for the benefit of our braver readers I will describe how the job should be done. First, you must make a parting-off tool. Obtain a piece of tool-steel about $\frac{1}{2}$ in. square and 4 in. long, and press one side of it up against a grinding wheel for about five days, renewing the wheel when necessary. At the end of this time, the tool will be reduced to a long thin blade. Just as you are giving a final touch of keenness to the cutting edge the whole thing will suddenly become red-hot, which makes it quite useless; throw it away, and go out and buy a proper one. Clamp it in the toolpost, set the lathe going, and advance the tool briskly into the work. Don't be intimidated by it, use a quick jabbing action, and as long as you stand well back to avoid the flying fragments of parting off tool, you will probably not be much injured. The thrupple nut will now have a cross-section like a lop-sided figure eight, so you will have to throw it away, and turn up another one. This time we will try parting it off in the traditional manner, with a hacksaw. Even this is not all plain sailing. You will think it is at first, but when you get three-quarters of the way through, a most surprising thing will happen. There will be a loud bang, and you will be thrown on to the revolving chuck, probably with the loss of three or four teeth, and when you recover consciousness, the thrupple nut will have *completely* disappeared. You can sift through every particle of swarf, examine every inch of the floor through a magnifying glass, search in the most unlikely places, you will never find it. Your thrupple nut has gone forever. I have a theory that when the diameter is reduced to a point where its periodic vibrations coincide with the nodal points of the hacksaw blade, the molecules of the metal actually pass through each other, thus forming Ughium, which is of course a gas. This remains to be proved.

I think I have written enough now to enable every budding machinist to proceed with complete confidence, as long as he does not try to exceed his capabilities. The beginner should not attempt to turn:

(*a*) Square things.

(*b*) H-shaped things, like television aerials.

(*c*) Complicated things, e.g., a scale model of Wimbledon made in basic slag.

Well, may success attend your efforts !

Would any reader care to buy a good second-hand lathe, with all accessories and 49 gross of half-finished thrupple nuts ? I am reluctant to part with this unique and valuable machine, which is by Holtspiffle, but the floor space is urgently needed. I am going to build an electronic organ.

★ *Our Cover Pictures*

Readers of *THE MODEL ENGINEER* are invited to submit for consideration photographs which may be suitable for cover pictures. The subject must be within the scope of this journal and reference to the covers of this year's issues of the " M.E." will give an indication of the type of photograph preferred. If accepted for publication, a reproduction fee of two guineas will be paid.

Prints should be addressed to . . . **The Managing Editor THE MODEL ENGINEER 19-20 Noel Street London, W.1**

SEASONAL COMPLAINTS !

By Mrs. Model Engineer

The coal box is quite empty,
Tho' we're in winter's grip
For hubby's in the workshop,
Planning his new ship.

The sofa springs are broken,
The chairs have many a chip,
But hubby's in the workshop,
Carving out his ship.

Our woodwork needs attention,
Paint peels off by the strip,
But hubby's in the workshop,
Painting his new ship.

All the doors are squeaking,
Their locks will never grip,
But hubby's in the workshop,
Greasing his new ship.

The kitchen tap is leaking,
It's got a steady drip,
But hubby's in the bathroom,
Testing his new ship.

And now the season changes,
The bees their nectar sip,
But hubby's on the lake side,
Playing with his ship.

We hoe our weeds with vigour,
But our efforts they outstrip,
While hubby weeds the blooming lake,
So he can sail his ship.

The lawn cries out for mowing,
Our hedges need a clip,
But hubby's on the lakeside,
Sailing his new ship.

Now, if you wives feel vengeful,
Then I'll give you a tip—
Go out into the workshop,
And crown him—with his ship !

L.B.S.C.'s Christmas Lobby Chat

OWING to the untimely passing of one of the originals of my "tales of the future" characters ("Lady Vera"), I haven't the heart to write any more of them; so our worthy Knight of the Blue Pencil suggested a special Christmas lobby chat, including some reminiscences. That was a bit of a sockdolager, because I have already recorded most of the earliest incidents I can remember, and many that occurred in later years. Memory grows dim as one approaches the terminal station of the Great Railroad of Life, and I've had a pretty long run on it, as it is. It seems way back in the dim and distant past, when I went shopping with mother on Christmas Eve, in the early 80's. Christmas during schooldays, was never much of a holiday for young Curly. Poverty and joy are poor home companions, the former taking the "festive" out of the "season." Somehow, I didn't care; it is said that "what you never have, you never miss," and if mother made a Christmas pudding, I was quite contented. Sometimes I was invited to a school friend's Christmas party; but I seldom went, being rather ashamed of my threadbare clothes among much better-dressed children.

One bright spot at Christmas-time was the school "concert" on the evening of breaking-up day. The school hall was cleared of desks, a platform was rigged up at one end, and chairs borrowed or hired to accommodate parents who attended to see their young hopefuls do a bit of acting, singing, and dancing; after which was the annual prize distribution by the dear old vicar of the local church, who always referred to us as "byes and gels," and was loved and respected by everybody who knew him. Now and again, he would organise a "show" in the Parochial Hall adjoining the church, in aid of one or other of the local charities. For this, the schoolchildren would act a sketch, an extract from a play, a fairy cantata or something of the sort, and also oblige with songs and recitations. Young Curly was invariably "requisitioned" for something or other. I had an excellent memory, and could learn the "script" of any boy or girl part by merely reading through it a few times. The great trouble was, that I was company-shy, and nervous of an audience of strangers (still am !), but I stuck it out, to avoid causing the vicar any disappointment. The results were sometimes amusing; for example, on one occasion I was called upon to recite Macaulay's "Armada," and got on swell, until I nearly sent the whole audience into hysterics by rendering the last lines as:

> "Till Skiddaw saw the fire that burnt on Gaunt's embattled pile,
> And the red glare on Skiddaw roused the *burglars* of Carlisle."

Some Way to Learn

My ability to learn things quickly, got me into the top class at the age of 11 years, three years sooner than normal; and the old Scottish "head" used to cite me as an example of the "perfect scholar." He would have had an awful shock if he had known that far from my liking lessons (what schoolkid ever did ?) my sole reason for getting them over quickly, was to avoid homework, and leave me free to spend all my out-of-school hours, either making toy stationary engines and locomotives, out of tin cans, and sundry other humble and cheap materials, or haunting the tracks of my dearly-loved London Brighton and South Coast Railway. I knew the numbers, names, and sheds of their whole fleet of locomotives, by heart, and can still recollect most of them, after all this time.

That same ability was evidenced in another way, which incidentally goes to show how ironic Fate can be when she chooses. Children often form lasting attachments, and I was very fond of a nice boy who had decided to stay at school, and become a teacher. He had the ambition to rise in the profession, and in order to obtain his first certificate, enrolled in the human physiology class at a South London centre. Just for a "barney," and to keep him company, I enrolled too ; and as far as I was concerned, the course was just a piece of cake, as I had only to listen to the professor who gave the lectures, and read the book, and I'd got it. My notebook was one big scream ! I gave the human blobs and gadgets engineering names, and put what I thought would be the corresponding locomotive components, alongside my sketches; the tummy was the boiler, the heart was the pump, the legs and feet were cylinders and wheels, and so on. Meantime, my pal swotted for all he was worth; and when we sat for the examination, *he failed*, while I was awarded a first in the advanced ! The old "head" couldn't believe it, until the results were confirmed by letter, after he had queried them. Anyway, my knowledge of human "giblets" has proved useful all through life, as I have been enabled to "look after myself" in a manner of speaking, and so far—touch wood !—have never needed the services of a doctor.

I've often thought how a steam locomotive and a human being have many points in common. For instance, if you fill the firebox nearly up to the crown sheet, the draught is choked, and the engine won't steam for toffee-apples. If the boiler is filled nearly up to the whistle, especially if the water is "hard," she will prime badly, and vomit part of the contents of the boiler, out of the chimney. If a man persistently overloads his tummy, he gets indigestion, dyspepsia, gastritis, and maybe a few more things that you read about in the patent medicine advertisements; he goes "off colour," and loses all his energy, like the locomotive when the needle of the steam gauge goes back, due to the choked draught. If he takes so much liquid refreshment, that he becomes "full up to the whistle," especially if he mixes the brands—oh boy ! ! Strict attention to Nature's requirements, has paid dividends all through my own life; and cleanli-

ness of body and mind, works wonders. True, I get tired now, much quicker than in the days now past; but an old locomotive hasn't the kick and the staying power of a new one, even after many years of careful attention, otherwise there would be no need to scrap the old engines and replace them with new ones.

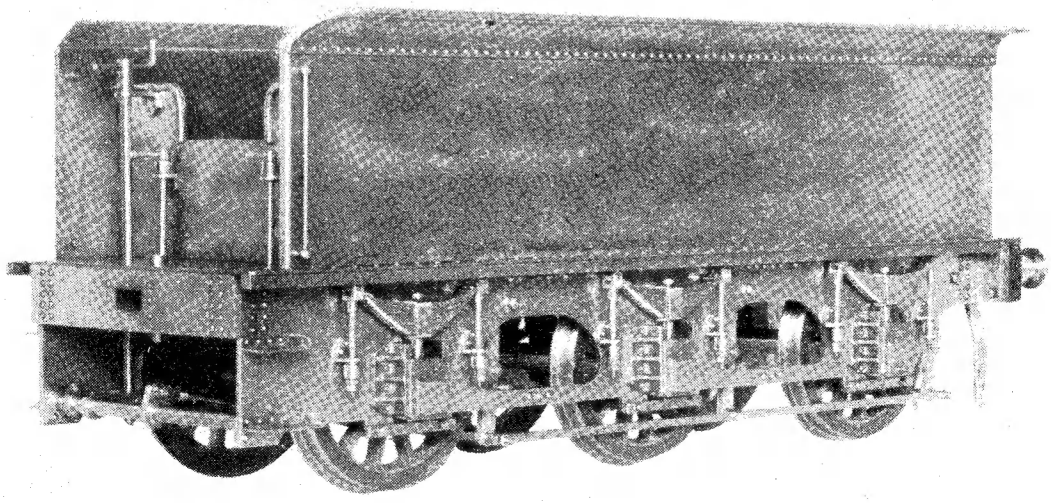
Christmas " On the Line "

The Christmas season was always a very busy time on the old " Look-Bill-and-See-Charlie's-Rabbits " as the kids usually called it. Nowadays, when most people own a car of some sort, and umpteen firms run motor coaches all over the Southern counties, in addition to the numerous bus services which radiate, not only from London, going well out into the country, but from all the principal South Coast towns, plus numerous cross-country services, there isn't much traffic left for the railway. If it were not for the fast electric services running so frequently on my old road, I guess it would now be in a pretty poor state. In the time of which I am writing, the motor-car was in its infancy, motor coaches and buses were unknown, and the electric tramway had only just made its appearance. I remember the storm of protest, and the heated correspondence in the newspapers, about the " disfiguring " of the streets with a " network " of overhead wires. Why couldn't they put them in a conduit, like the cable of the Kennington-Streatham line, was the cry of the objectors. Well, they *did*, eventually, on a number of London routes, only they used conductor rails instead of wires—and now they are pulling the whole lot up again—such is the march of progress !

Thus it was, that around the turn of the century, the railway was faced with the task of conveying practically the whole of the Christmas holiday-makers, their baggage, and their parcels which were sent separately. The parcel rates on the L.B. & S.C.R. were in many cases cheaper than parcel post, and certainly quicker, although horse traction was the only means available, of making house deliveries. At London Bridge, Victoria, and some of the other principal stations, temporary parcels offices were erected on the circulating areas, and extra clerks employed; and even these were overwhelmed. It was really hectic, the week before Christmas. Special parcels trains were run, and you can bet your bottom dollar that the enginemen made plenty of overtime. It was on one of these runs, that the engine on which I was firing, ran over a sheep one night on Earlswood Common. How it got on the line, we never found out, but I was looking over the side, and just caught a glimpse of what I thought at the time, was somebody in a dirty whitish coat or mackintosh, falling under our wheels. It made my inside " turn over," and I said to my mate, " We've run over somebody." Of course, we felt nothing on the footplate and he just thought I was " seeing things." However, when we got to Lewes, I just had to get down and take a look, dreading what I would see; but to my intense relief, it was the sheep—or rather what remained of it. The front of the engine below the buffer-beam was in a shocking mess, as you can well imagine, but there was enough sheep left, jammed up between the cylinders and the brake rodding, for our Sunday dinners. Genuine English home-killed mutton, at that !

Types of Passengers

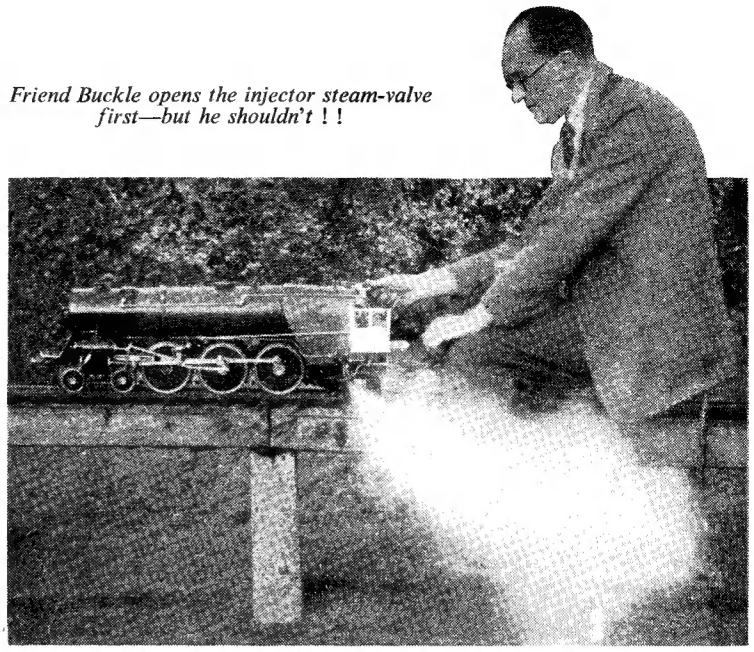
During the Christmas rush, naturally many special trains were run, and many of the goods drivers and firemen got their first experience of fast passenger train working. It was a common practice of two, at least, of the district superintendents, to give the goods men a " break " from working the slow goods and coal drags, and night shunting at Norwood, Battersea, and other depots, and let them take turns on the day excursions, both in the summer, and at Christmas time. Most of the passengers were " all right," especially the day trippers, on the summer excursions. There weren't many day trips around Christmas; but plenty of " over the



Tender for 3½-in. gauge Stirling " 8-footer," built by " Bro. Pimples "

holiday " cheap tickets were issued, and the trains were numerous and well-filled. Folk in those days, didn't have so much time off as they do now, and weren't so work-shy; and the busiest day for the outward runs was Christmas Eve. The trains usually reserved for the early-morning " workmen's " had to be pressed into service; these were mostly 14-coach sets of four-wheeled stock, five compartments to a coach, and low-backed seats; we called them cattle-boxes. They only weighed about 8 tons apiece, ran very easily, and the engines treated them like bags of feathers, even when fully loaded, with passengers standing in the compartments. You can guess that they didn't run as smooth as a modern bogie coach at 70 m.p.h. or more, but did the Cockney trippers worry ? Not on your life ! The more we shook them up, the better they liked it; all they thought about, was getting there. I remember a typical " 'Arry from 'Oxton " coming up to the engine at Brighton, with a smile all over what he would have called his " dial," and remarking, " They said as 'ow these 'ere cheap trips was slow, but corblimey, matey, yer don't 'arf know 'ow ter 'op it ! " On that particular run, we had knocked off the 49½ miles from London Bridge to Preston Park (where tickets were collected) in a little over what the stop-watch specialists call " even time "; the faster we got over the road, the more trains could be run. As far as I can recollect, the engine on that occasion was a single-wheeler, 348 *Lullington*; there wasn't much " lull " about her, once she got her big solitary pair of driving-wheels spinning !

On the specials, most of the passengers were too busy bagging seats, looking after wives and children, and seeing to their baggage, to bother about the engine or its crew; but there were a few locomotive " fans " who would come up and see what kind of engine was at the head of the train, and pass a cheery word with the driver and fireman. All the passenger engines had names, and naturally the small boys, who had no counter-attractions in those days, made a list of them; if we happened to have a goods engine, which was often the case on the specials, they were quite disappoined because it only bore a number. One boy asked me why the goods tender engines didn't have any names, while the goods tank engines did; I replied quite solemnly, " Well, sonny, you can see for yourself, that the wheel splashers aren't big enough to paint a name on." He was quite satisfied !



Friend Buckle opens the injector steam-valve first—but he shouldn't ! !

" Superior " Persons

There were several types of passengers that used to make the enginemen " see red " apart from a danger signal. I remember on one occasion, a pompous old buffer (apologies to the buffers on the engine ! !) brought two boys up to our engine, planted them close to the cab, stooped down and said something to them, pointed to us, and then stepped back, with a sneering, supercilious half-smile on his ugly face, as though he considered that the engine was a sort of glorified toy to interest his kids, and quite beneath his dignity to notice. Your humble servant just " boiled up," and how the merry dickens I refrained from bringing his air of patronage to an abrupt termination with a nice juicy " socker " (a handful of oily and dirty waste, dipped in water) I don't know to this day ! I'm sure our boss would have let me off with a caution, as he would have " understood."

One foggy night during the Christmas week, we pulled into London Bridge with a train from Eastbourne. It had been a heck of a journey, as the evening was damp and foggy, the train heavy, the coal none too good and one of the sandpipes was blocked. The fog was one of those swirly, patchy ones, where one minute you can see quite a good distance ahead, and all-of-a-sudden-Peggy, the chimney has done the disappearing trick. Fortunately, we had a clear road; that sounds like Pat speaking, but I mean " clear " in the sense that there were no signal stops, and we struggled in, no more than five minutes late. As the passengers streamed past the engine, I wondered how many of them realised, as they sat in the carriages, what a job it had been, to land them safely. Then a group of four men, well-dressed and apparently of the class we used to call " aristocrats," passed close to the cab; and one of them, in a voice loud enough for us to hear, remarked to his companions that " the damned drivers on this line could do with a few lessons in timekeeping." We had brought them safely from the coast, under difficult conditions and wretched weather, and our reward was a studied insult. I made no comment, but my mate said a mouthful. Thank goodness, such folk were in the minority. Incidentally, in those days, there were three classes of coaches; first, second, and third. The railwaymen always used to say that first-class passengers were " toffs," third-class passengers were just ordinary common people, but second-class passengers were ordinary people trying to make believe they were " toffs." The old Midland Railway was the first to do away with " seconds," and the other lines gradually followed suit, except for the Southern boat trains, on which second-class carriages are run, to " mate " with those on the French trains.

In the Sheds

" After the storm, there comes a calm," avers the old saying. Thus it was with the old railway; after the pre-Christmas rush, the day itself was very calm and peaceful. Apart from one or maybe two specials, to cater for night workers who may have been working on Christmas Eve, and finished too late to start their holiday travel until Christmas morning, the Sunday service was run. In those days, this service was merely a skeleton, and the Sunday " church-time " break was observed, nothing running between about 10.30 a.m. and 1 p.m. There were no goods trains at all, and the locomotive sheds were full of "dead" engines. I worked the 1 p.m. to 8 p.m. shift, on the first Christmas I ever spent on the railway, and what happened during those hours (very little !) I recorded some years ago. In later years, I worked on two or three occasions, on the local trains, and the only bit of excitement was when a man who had been looking on the wine when it was red, and the whisky when it was yellow, fell off the platform in front of our engine, just as we were stopping at East Dulwich. Luckily he rolled clear, and was unhurt, save for a few bruises, and abrasions from the ballast.

That incident reminds me of another funny one which happened many years later, when I first went to live at Norbury. I had one of the old " tin Lizzie " Ford cars—and a jolly good car it was, too, as far as the " going " part was concerned—and one evening, on my way home from North London, happened to form one of the first line of traffic stopped by the policeman on point duty at the junction of what the " tube " drivers call Tottenham-Court-Road-Street, and Oxford Street. As we waited for the opposing traffic to cross, an elderly man, who had apparently outstayed his welcome at the " Horse Shoe " at the corner, staggered and lurched across the road, nearly cannoned into the " traffic cop " (there were no lights nor roundabouts in those days) bumped into the radiator of my gas buggy, and sat down in the dirty and muddy road. He loosed off a string of unparliamentary remarks, scrambled to his feet, and called the policeman, demanding my immediate arrest *for knocking him down* ! ! The " cop," who had, of course, seen the whole business, at that moment gave us the signal to cross, so I don't know the sequel.

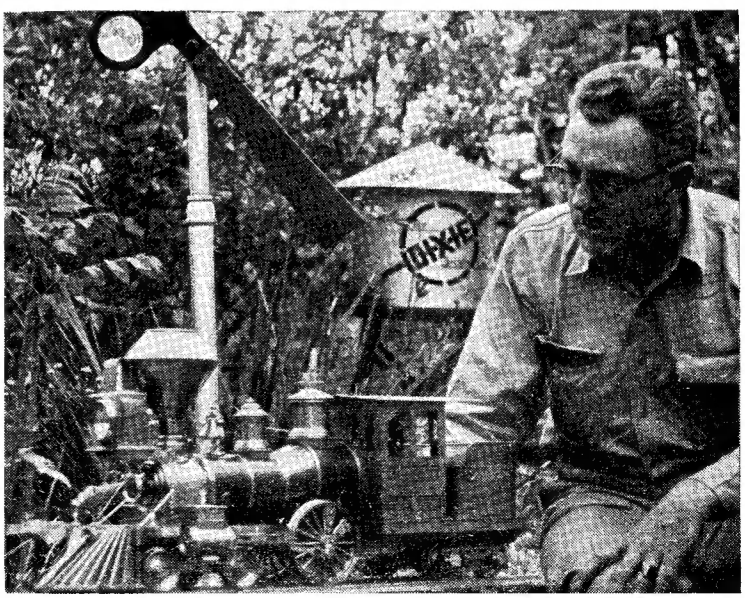
Paid " Homework "

One Christmas time around the turn of the century, the railway company paid me full wages for doing a job for myself; and it was quite legitimate, too ! This was how it came about. At that time, the big water tank which supplied the water-cranes at London Bridge, was filled from a well under the station. The pumping engine was situated in one of the arches, over which the station was built. It was a very old horizontal engine, geared to a big double-acting beam pump, something like a marine side-lever engine. Two smaller pumps were also connected to the beam, for supplying the offices, lavatories, etc., with water, before they were connected to the mains. The boiler was of the Cornish type, a big cylindrical affair set in brickwork, with a large single flue, the front part of which formed the firebox. The working pressure was only 30 lb. The whole bag of tricks looked just like the sort of outfit you see in the Science Museum, and had apparently been installed when the station was first built. I forget the size of the single cylinder, but the guide bars were of square section, set " on edge " like the old locomotives, and a cross-head pump was fixed at one side of them. The flywheel was about 9 ft. diameter, and made about 50 revolutions per minute.

The regular " engineer-in-charge " was a one-time footplate man who had developed a physical defect which made him unsuitable for locomotive work; and it so happened that he fell ill. The locomotive foreman, knowing my interest in all things mechanical, asked me if I would like to take over " *pro tem* " for a bit of a change, and I said I'd be only too glad. The job was the easiest I had ever been on, as the boiler needed very little firing, and the engine did not run continuously. There was a tell-tale on the tank, which could be seen from the top of the steps leading down to the " engine-room," the steps being situated alongside the rails at the end of one of the platforms. It was only necessary to run the engine when the tell-tale dropped below a certain level, and the tank soon filled.

Time dragged a bit, so I cleaned up the fittings on the boiler front, and gave the old engine a real birthday treat; they both needed it. I found out afterwards, that the regular man didn't spend much time below, but used to go up on the platforms and do what was known as a bit of " fluffing," that is, carrying passengers' luggage, during the busy periods, and supplementing his wages with tips. Incidentally, the poor old chap died soon after resuming work. The arch in which the boiler and pump were situated, also served as a workshop for the old fitter who did all the odd jobs about the station; it contained a good-sized bench, to which was

(*Continued on page* 687)



Harry Dixon builds an oldtimer, the " C . P. Huntington "

A Portable MULTI-GAUGE TRACK

By S. J. Applewhite

IN 1951, the Burton-on-Trent Society decided to embark upon the construction of a multi-gauge track, and I think that the design, which was the subject of much thought, will be of interest to other societies who are contemplating a similar project.

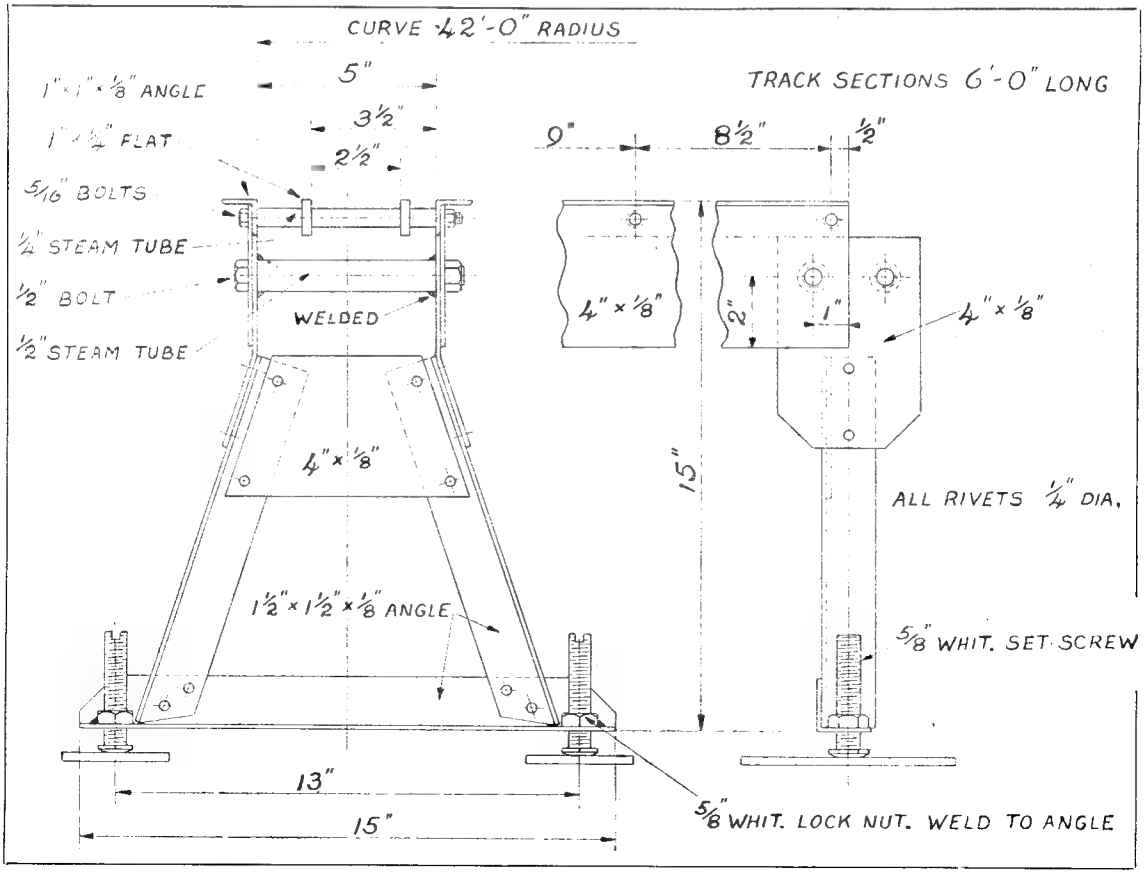
A permanent concrete structure was out of the question, as we had no site on which to erect the track, and in any case, our labour force was limited. Brass or alloy rails also had to be ruled out, owing to the expense. We decided, therefore, to construct the track in steel and to use light sections in order to minimise the labour involved in cutting, sawing and drilling.

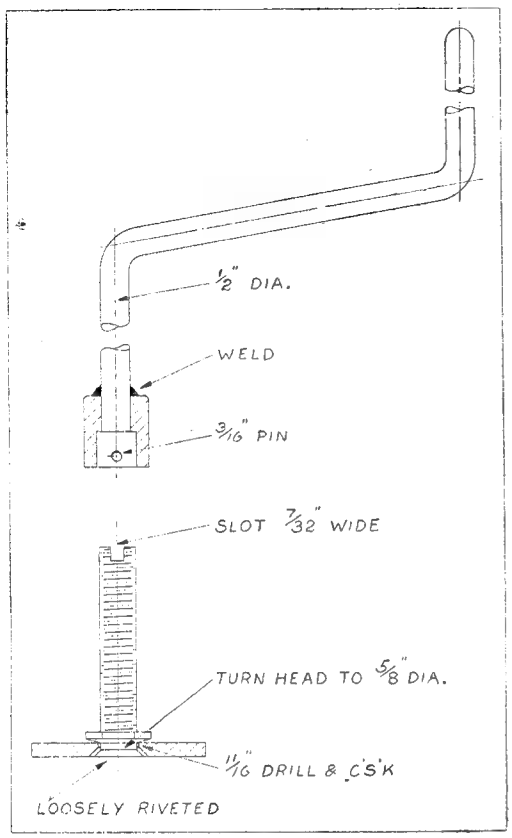
As it was intended to use part of the track for running at fetes, etc., four important considerations had to be borne in mind, namely, lightness, rigidity, portability and ease of erection. The track is made in 6 ft. sections, the outer rails being 1 in. × 1 in. × $\frac{1}{8}$ in. angle stiffened in a vertical direction by 4 in. × $\frac{1}{8}$ in. flats, and with inner rails of 1 in. × $\frac{1}{4}$ in. flat, the whole being bolted together with $\frac{5}{16}$-in. bolts passing through tubular spacers from $\frac{1}{4}$ in. standard steam tube, which is big enough in the bore to take a $\frac{5}{16}$-in. bolt. Each section weighs 42 lb. and is perfectly rigid both vertically and laterally.

The stands are constructed from 1$\frac{1}{2}$ in. × 1$\frac{1}{2}$ in. × $\frac{1}{8}$ in. angle with side and gusset plates from 4 in. × $\frac{1}{8}$ in. flat, spacers from $\frac{1}{2}$ in. steam tube being welded in where the joint bolts pass through. Two $\frac{1}{2}$-in. bolts are fitted at each joint and when tightened up make a joint which will not shift under the severest stress which it is likely to encounter.

As thin pieces of packing are always a nuisance on outside jobs, the stands are provided with adjustable feet giving approximately 2$\frac{1}{2}$ in. adjustment, which means that a few thick wood packings only are required for the most uneven sites.

On the bottom angle of the stands, two $\frac{5}{8}$-in. Whit. lock-nuts are welded, and the adjusting screws are $\frac{5}{8}$-in. set-screws 3$\frac{1}{4}$ in. long, with the heads suitably machined for loosely riveting in the feet. For the feet, 6-in. discs of $\frac{1}{4}$-in. plate were used; these, however, were war surplus, so the drawing shows 6 in. lengths of 3 in. × $\frac{1}{4}$ in. flat, which should provide sufficient area for all ordinary purposes. The top of each set-screw is slotted and a suitable key with extended handle enables





Key with extended handle for height adjusting of track

height adjustment to be made without any back bending.

For the curved sections, a radius of 42 ft. to the inside of the outer rail was decided upon. This is suitable for 5-in. gauge engines, and has the advantage of giving a circle which divides up into 44 sections almost exactly 6 ft. long, enabling one template to be used for the straight sections and the outer rail of the curved sections.

The curved sections are similar in design to the straight sections, and the lengths of the inner rails were calculated to suit the different radii.

For a radius of 42 ft., the lengths are as follows:—

Outside angle: 6 ft. 0 in.

Outside flat: 5 ft. 11 13/16 in.

Inside flat: 5 ft. 11 13/32 in.

Inside angle: 5 ft. 11 9/32 in.

Only the angles were bent, the side plates and inner rails assuming the correct curvature when the sections were bolted up. To bend the angles, convex and concave jaws 6 in. long were made for a No. 10 Fortis all-steel vice. These jaws should have a radius smaller than 42 ft., because when bending an angle it curves also in the direction you don't want it to do, and when eliminating this unwanted curve the original curve tends to straighten out. However, there is no great accuracy required in making the jaws, I made mine to guesswork, and the curves came out fairly well. With suitable supports fitted to one jaw, to hold up the angle, it is surprising how quickly the angles can be bent.

After completion of the track, a local manufacturer was kind enough to allow us to use a corner of his sports ground, and a circuit of approximately 400 ft. has been in use since early in 1952. As the site was made-up ground, we decided to place a 2 ft. square concrete slab under each stand, which has proved very satisfactory and very little subsequent adjustment has been required.

Super-elevation of the curves can be obtained by means of the adjustable feet. No trouble, due to expansion and contraction, has been experienced; if the track does move, it moves as a whole and the joints always remain perfectly in line.

We have no transition curves on our track, but such curves could be incorporated by making special sections, should they be desirable.

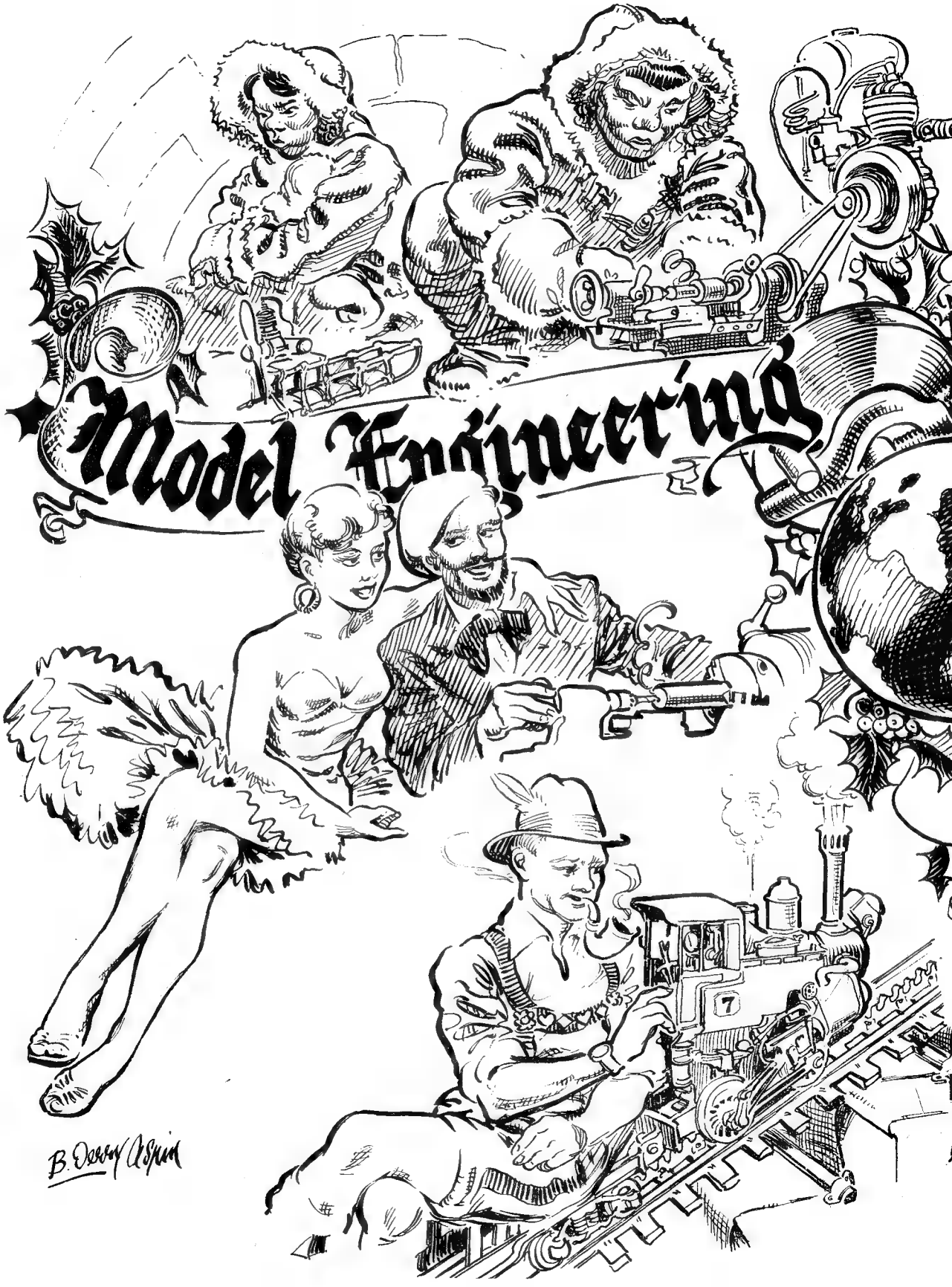
I think this design of track offers big advantages when a society has no permanent home of it's own; and within the limitations of the curves, the shape can be anything which may be desired.

L.B.S.C.'s CHRISTMAS LOBBY CHAT

(*Continued from page 685*)

attached a big old-fashioned leg vice. He also kept a box of tools down there. Naturally I struck up an acquaintance with him and his mate, and told him about my amateur locomotive building. He said: "Well, why not do a bit here? You can use the bench, and the vice, and any of the tools you want." I didn't need any second invitation, but started in on the construction of the little "C" class 0-6-0 which, later on, became the subject of my early valve-gear experiments. It was on her, that I found out that proper lap, lead, and early-cut-off were just as important for successful and economical working, as they were in full size, and that the ideas of the self-appointed "experts" of that time, were so much tommy-rot. I was rather sorry when the temporary job ended, as I made quite good progress with the little engine, and it was far better than working at home, in a corner of the kitchen.

Some years after, the water tank was connected to the main, and pumping discontinued; I heard later, that the whole outfit had been scrapped. I believe the arch was used as an air-raid shelter during the era of bloodshed and destruction, and was penetrated by a bomb, with considerable loss of life among the shelterers. The block of offices adjoining the station was completely burned out. This reminds me that one day, in 1902, if memory serves me rightly, there was great excitement among passengers, porters, enginemen, and everybody at the station, and in the vicinity, and all eyes were turned skyward. The centre of attraction was a little sausage-shaped balloon, with a small car underneath, and a propeller turning around at the back of the car, driven by a small oil engine. On both sides of the balloon, was the inscription "Mellin's Food." I have often thought—and I still think—that if aeronautics had never got beyond that stage, the world would have been a much safer and far happier place than it is today. Nuff sed!


Model Engineering
7

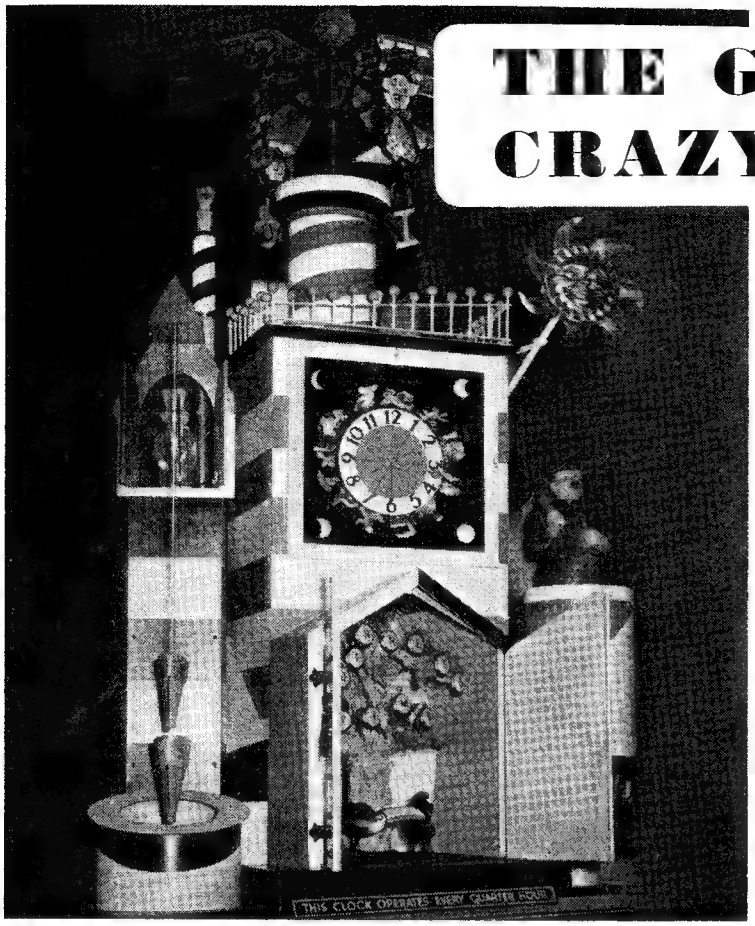

NYC
In Other Lands

THE GUINNESS CRAZY CLOCK

The inner secrets of an ingenious mechanical novelty which was one of the most popular of the "M.E." Exhibition attractions.

Disclosed by

Edgar T. Westbury

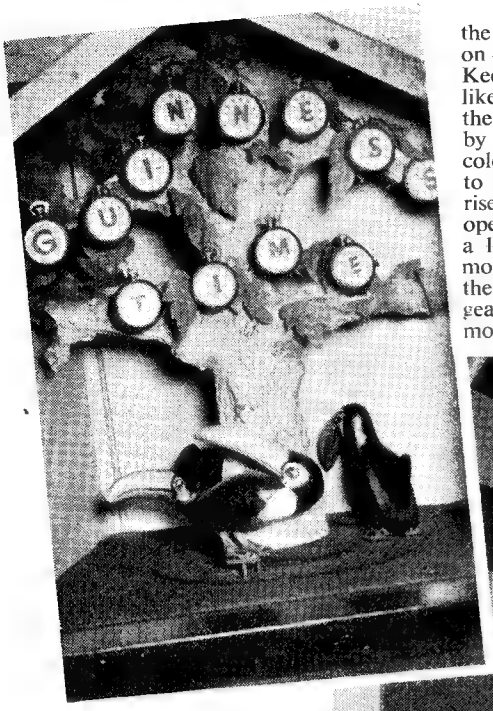


THE uses to which clock mechanisms have been put, during the long history of their evolution, are many and various—some have been novel and entertaining, some useful, and some, as we remember only too well, have been sinister. The idea of embellishing a public clock with mechanical figures is very old; originally the figures, and the movements they performed, were very simple, such as a man with a hammer striking a bell to mark the hours. These have been very popular, particularly on the Continent; a wooden figure of this nature, at Sluis, in Holland, survived several centuries despite the effects of weather and several wars, and when the clock tower was demolished by bombing during the last war, the beloved "wooden man" was rescued, renovated, and eventually remounted in a new tower. Some notable examples have also been seen in this country; they were usually known as "Jacks," and in many cases have come to be associated with local history and legend. Later, clockmakers became more ambitious, and elaborated the movements of mechanical figures, in some cases using them as puppets to enact some dramatic scene. A very modern example of such a device in a historic Midland city has recently been the subject of rather heated controversy.

The fact that clock-operated "robots" always have, and still do, attract considerable attention, has now opened up new possibilities for their application in publicity displays. This has often been done on a small scale, such as by exhibiting "novelty" clocks in shop windows; but the most elaborate, and in many respects the most interesting, example of a clock designed purely and simply for this purpose is the Guinness clock, originally erected at the Battersea Pleasure Gardens in 1951. This attracted so much attention that there has been a demand for further clocks of similar type, for display in various parts of the world, and also for a smaller, portable version of the clock for indoor exhibitions. The latter, which may quite justifiably be termed a model, was one of the attractions at this year's "M.E." Exhibition, and is the one I propose to describe; it is not absolutely identical in design with the original clock, as some of its details have been improved as a result of experience, and others have been modified to suit the reduction in size; but the working principles are the same.

In the historical examples of "robot" clocks, the only means of furnishing the necessary power to work the figures was that obtained from a falling weight, a spring, or in a few cases, by water power; this undoubtedly restricted the scope of the mechanism which could be employed. Nowadays, however, the possibilities are much increased by the availability of electric motors, with relays and automatic controls. This enables much more complicated movements to be carried out, and the duty of the timekeeping mechanism to be lightened, as apart from driving the hands, it needs to serve only as a time switch, to bring various motors into action, through the operation of relays.

The model shown at the "M.E." Exhibition was of particular interest by reason of the visible control gear, and as might be expected, many visitors to the exhibition were far more interested in this than in the figures themselves. In common with most elaborate clocks, the time mechanism is small and simple,



The " Toucan Ballet " under the Guinness Time Tree

consisting in this case of a synchronous motor, with the necessary reduction gearing to the hands and switch contact dial, and provided with a " synthetic " tick which can be amplified as required. Around the clock face is a transparent Zodiac ring, but having the traditional characters replaced by coloured representations of the figures from the well-known Guinness posters; this is rotated continuously by a friction roller from a small motor.

At the " M.E." Exhibition, the mechanical figures were brought into action every quarter of an hour, for the benefit of the observers who waited patiently to see them perform. These also portray some of the popular and highly humorous poster characters.

Sequence of Operations

As the mechanism comes into action, a musical box, provided with an amplifier, in the base of the cabinet is started up, and plays appropriate music during the time the figures are in action. The first on the programme is the Zoo Keeper, who is housed in a pulpit-like compartment on the right of the clock tower, normally closed by a canopy similar to a gaudily coloured umbrella. This is timed to open before the keeper starts to rise, by means of a motor which operates the hinged canopy through a leadscrew and linkage. Another motor-driven leadscrew then elevates the keeper, while two other worm-geared motors operate, one to move the keeper's arm as he swings his handbell, the other to move his head from side to side. While these operations are in progress, the gilded Sun disc above the keeper's head gyrates like a windmill.

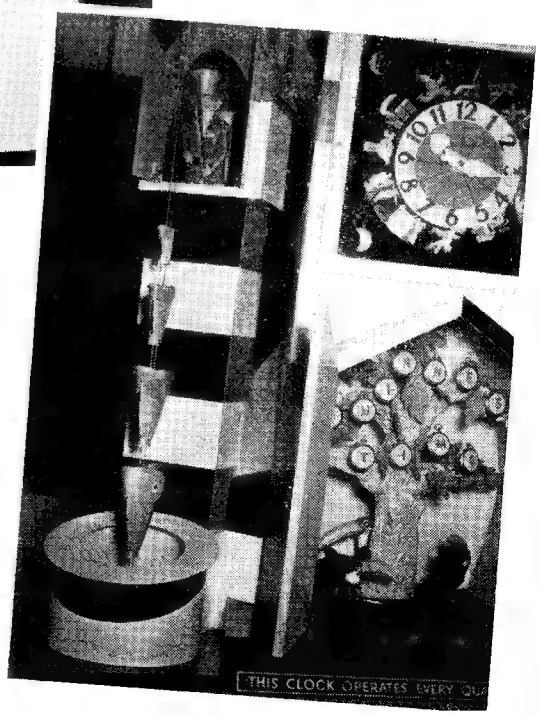
Above: The canopy opens, and the Zoo Keeper rises, bell in hand, to open the programme

The " Toucan Ballet "

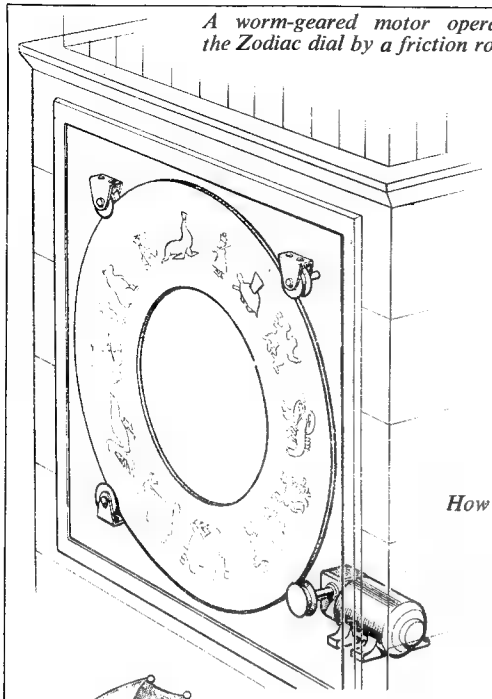
The double doors in the lower part of the clock tower then open slowly, operated by a motor driving a leadscrew, the nut on which operates upper and lower chains, driving sprockets which run freely on vertical shafts at the two sides of the compartment. The upper sprocket on one side, and the lower one on the other, are provided with crank arms, which operate the door hinges through connecting links. As the door opens, the Toucans are revealed, performing their ballet around the Guinness Time Tree. The mechanism for this incorporates a turntable operated by chain and sprockets from a worm-geared motor, and the bird-figures are supported by rods working freely in vertical guides. The rods have rollers at the lower end, resting on a cam track, so that the birds move up and down, simulating a hopping motion as they move round.

The Ostrich

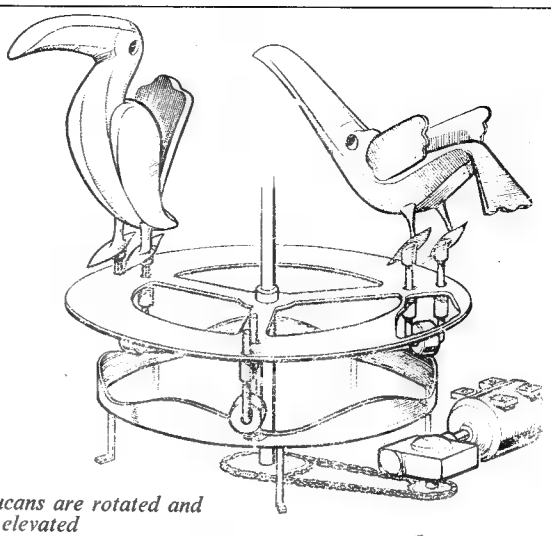
On the left of the tower is a minaret with a spirally-striped chimney from which the head of the Ostrich now emerges, complete with its characteristic dilation (" beer-



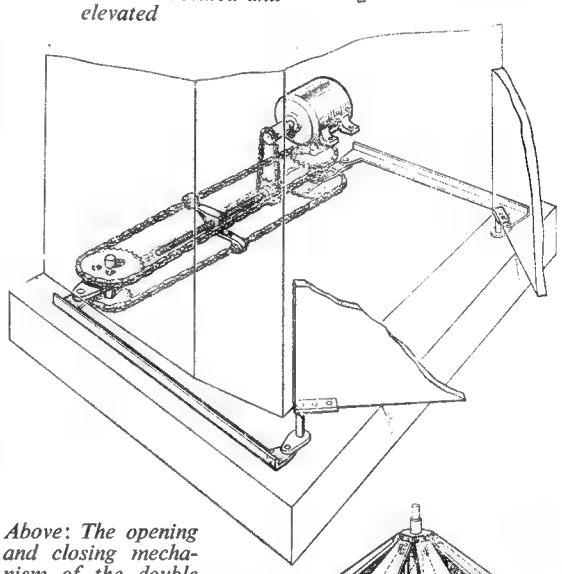
Right: Extraordinary angling by the Mad Hatter



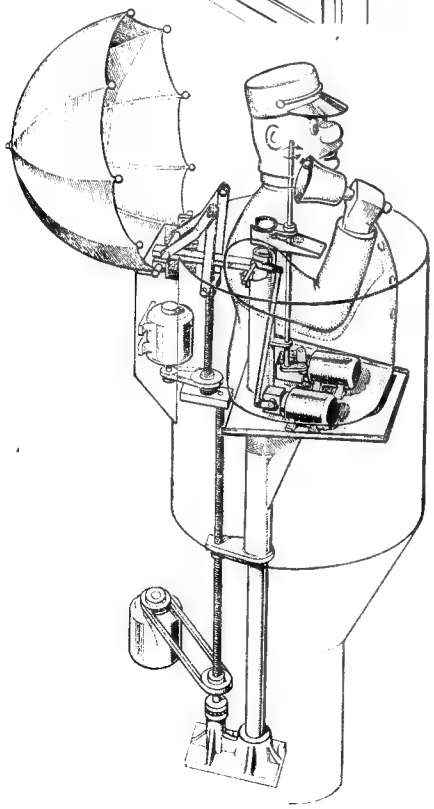
A worm-geared motor operates the Zodiac dial by a friction roller



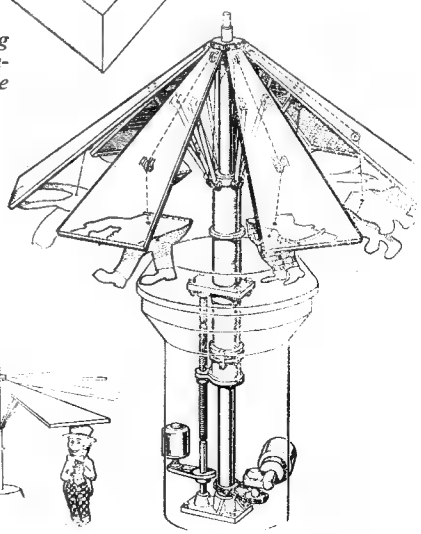
How the Toucans are rotated and elevated



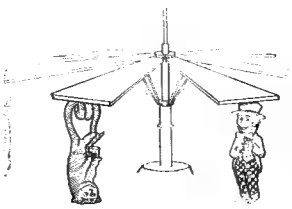
Above: The opening and closing mechanism of the double doors



The four motors operate elevating screws and cranks for animating the Zoo Keeper



Right: How the Roundabout is brought into operation



glassitis ") of the neck. This also is operated by means of a motor-driven leadscrew; meanwhile, the chimney is gyrated by another worm-geared motor. In order to enable the Ostrich's head to go into the narrow chimney, the beak is made to fold upwards, a roller being fitted along the underside to prevent undue friction between the beak and the inside of the revolving chimney.

The Mad Hatter

Now the double doors of the minaret open, and the Mad Hatter stands on the threshold, leaning outwards, with his fishing rod; this movement is operated by two toggle links from a leadscrew driven by another motor. The reeling of the line is operated by a worm-geared motor under the minaret roof, driving a bobbin by a chain and sprocket; a belt from this also operates chains and sprockets inside the figure to work its arm, winding a dummy reel. A large fish is drawn up from the well; from its open mouth emerges a slightly smaller fish, and so on until four fishes are seen suspended in mid-air. This is contrived by operating a multiple line indirectly from a platform raised and lowered from the bobbin; counterweights on the individual lines rest on the platform, but have a limited movement, controlled by stops, which determine the final height of each fish.

The Roundabout

The segmented roof of the clock tower now opens like the petals of a flower, operated by linkage like that of an unbrella, from yet another motor-driven leadscrew. Cords and pulleys attached to the sliding hub of the linkage then lower into position folded pendant figures of characters from the Guinness posters. The assembly is rotated on its axis by another worm-geared motor, through a chain and sprocket.

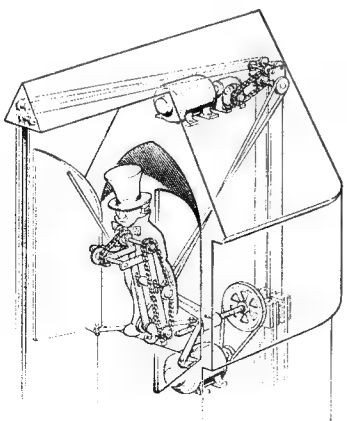
Concluding Movements

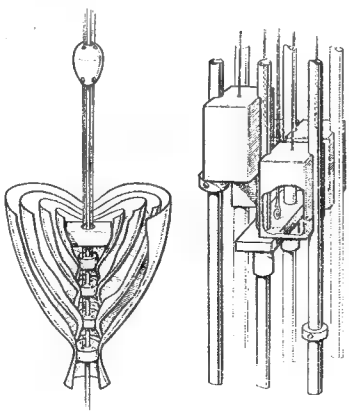
Each component of the mechanism, having performed its " turn," is retracted in reverse order, and finally the Zoo Keeper goes down, ringing his handbell, the canopy closing over him as the music stops. In this sequence, many of the motors have to be reversed, and this is done by means of relay switches. To prevent risk of overrunning the proper working limits, and possibly jamming the leadscrews or gearing, micro-switches are fitted which cut the motor circuits when the required movement or traverse is completed.

Controls

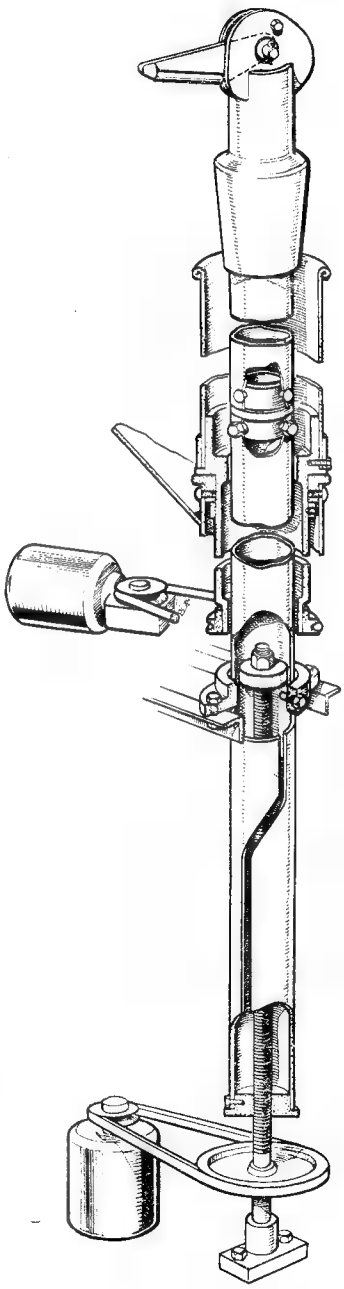
Altogether, there are fifteen electric motors in the complete system, including the synchronous motor which drives the time control, and the geared motor of the musical mechanism. Of the rest, seven have worm reduction gearing incorporated, and the rest operate, by belt drive, the various leadscrews. Only the amplifier of the music box employs thermionic valves; for the rest, the mechanism is purely electro-mechanical, involving the same principles as may be found in automatic lifts and many other familiar devices.

The fact that the Guinness clocks are intended purely as advertising devices does not in any way detract from their interest as ingenious mechanisms, and I feel sure that many readers will welcome these details, which may even give them ideas for working out auto-control devices of their own. And with such a contribution to mechanical and electrical craftsmanship to their credit, who will venture to criticise this famous firm for bringing home, to the few people who do not already know it, that " any time is Guinness time " ?





The Mad Hatter reeling gear, and the four weights with limit stops for raising the fishes



Motors for rotating the chimney and raising the head of the ostrich

IN THE WORKSHOP

BY DUPLEX

DRIVING THE CIRCULATING PUMP

THE small circulating pump described in the previous article can, when fitted with a pulley, be driven by a belt from an electric motor or from a lineshaft. But the high-speed drive necessary for this type of pump can, perhaps be arranged more easily by coupling the pump spindle directly to the motor itself; moreover, the pump then becomes a self-contained unit and the bearings are less heavily loaded.

The Electric Motor

Although any small, fractional horse power motor of continuous rating will serve for driving the pump, the motor fitted in the present instance is an ex-W.D. rotary transformer of 20 W output. When a machine of this type is used as a motor, the wiring connections are arranged in accordance with the diagram in Fig. 2, and a small, insulating panel is attached to the motor frame to carry the terminals for connecting to the electric mains. This particular machine was obtained from Messrs. D. M. Rogers of 31, Nelson Street, Southport, and when running at some 1,500 r.p.m., it drives the pump fast enough to give a satisfactory output of approximately one gallon a minute.

To enclose the brush gear of the motor, and to prevent accidental contact with any live points of the wiring connections, the motor is fitted with an end-cover of the pattern shown in Fig. 3.

The cover can either be specially made, or it may be found that a food tin, with the cover sweated in place, will fit the motor.

As shown in the drawing, a rubber or plastic grummet should be let into the cover to protect the input wiring from chafing.

The brass fitting, with a recessed, central boss is either turned from the solid or built up; the base flange is attached to the end-plate of the motor and the central stud and nut then serve to retain the cover in place. While on the subject of electric motors, it may be helpful to give some further information on points raised by correspondents about the motor fitted to the internal grinding attachment, recently described in these pages.

A suitable motor, designated A20/S1A, is now supplied by Mr. K. R. Whiston, of 8, Watford Bridge Road, New Mills, Nr. Stockport.

The wiring connections for this motor are shown in Fig. 4 and, if the terminal panel has been damaged, it is best to make a new part carrying three 2 B.A. terminal studs: *A*, *B*, and *C*. The motor can then be wired to run in either direction, by connecting the input to either *A* and *B* or *A* and *C*.

The Motor Mounting—Figs. 5 and 6

This cage was machined from a length of duralumin bar. A recessed register, $1\frac{3}{4}$ in. in diameter, was turned to fit the corresponding register on the pump gland-plate, and the parts were held together by

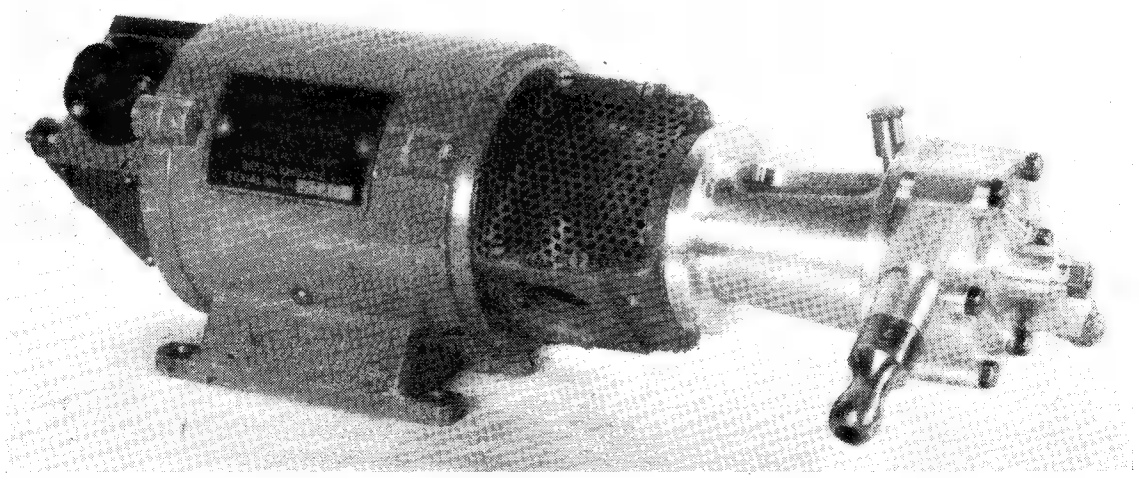


Fig. 1. The pump with self-contained motor drive

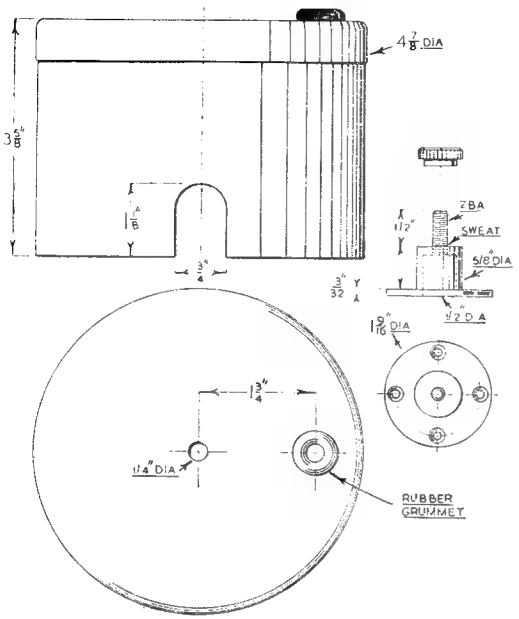


Fig. 3. The motor cover

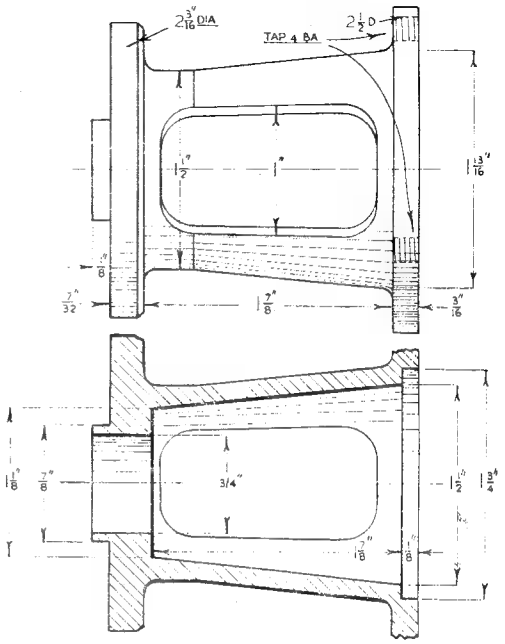


Fig. 6. Details of the pump cage

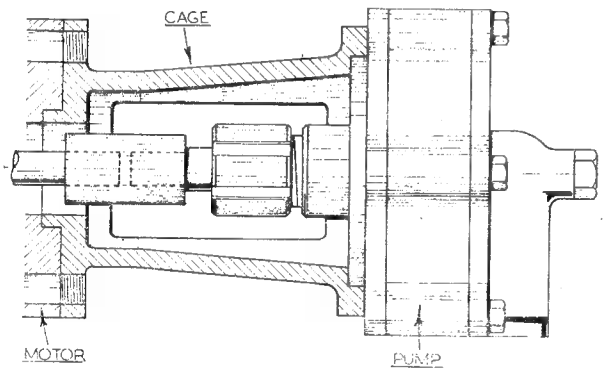


Fig. 5. The cage for mounting the pump on the motor

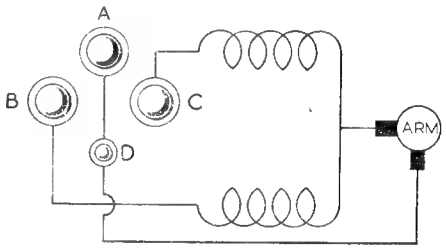


Fig. 4. Wiring diagram for the motor fitted to the internal grinding attachment

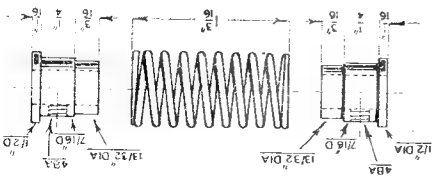


Fig. 7. The spring coupling

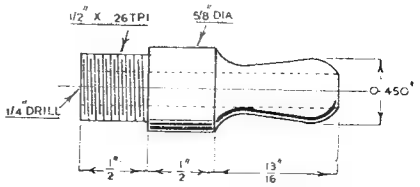


Fig. 8. Details of the piping nozzles

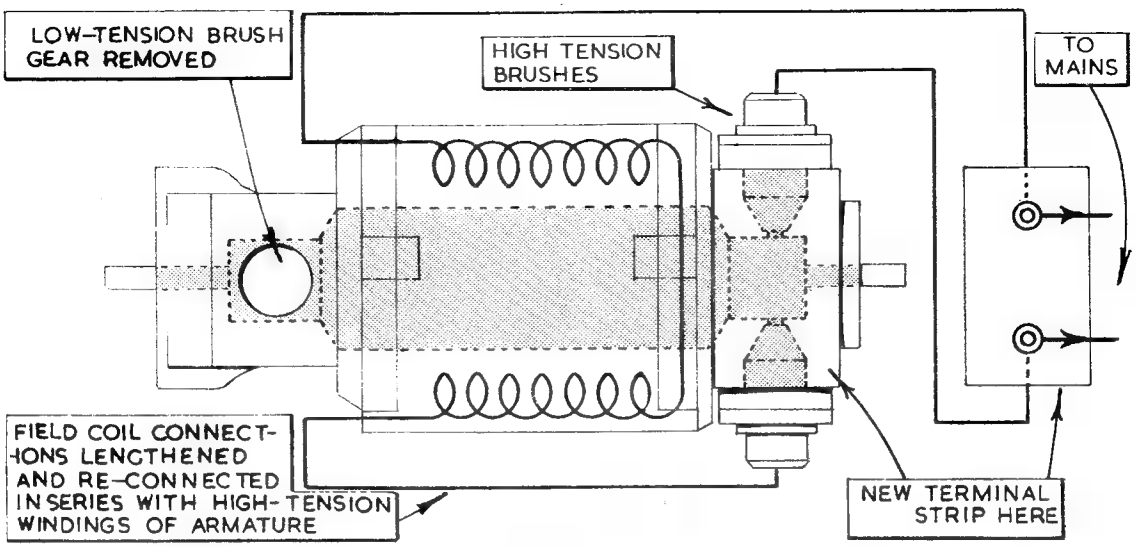
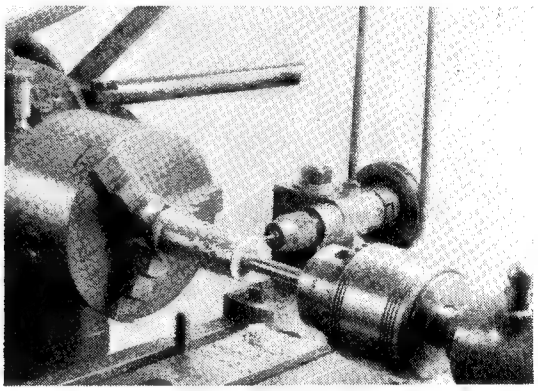


Fig. 2. The motor wiring diagram

three hexagon-headed screws, spaced evenly between those attaching the gland-plate to the pump body. At its other end, the cage is formed with a register spigot and bolting face to suit the particular motor fitted. A window is cut out on either side of the cage to allow the motor coupling to be fitted and secured.



Right: Fig. 10. Drilling the inner cage of the filter

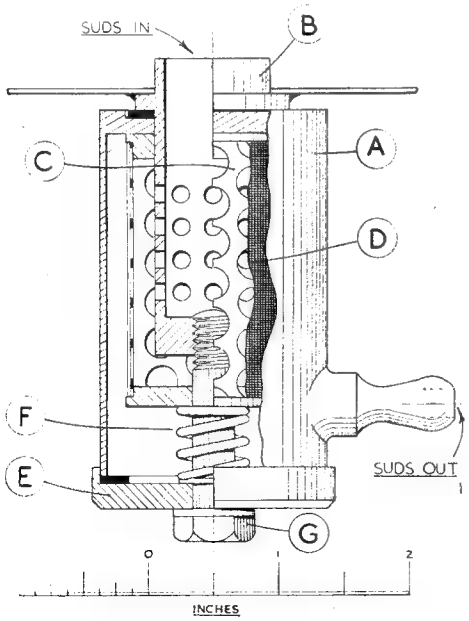


Fig. 9. The filter: A—the casing; B—the inner cage; C—the outer cage; D—wire gauze filter; E—the recessed cover; F—pressure spring; G—retaining-screw

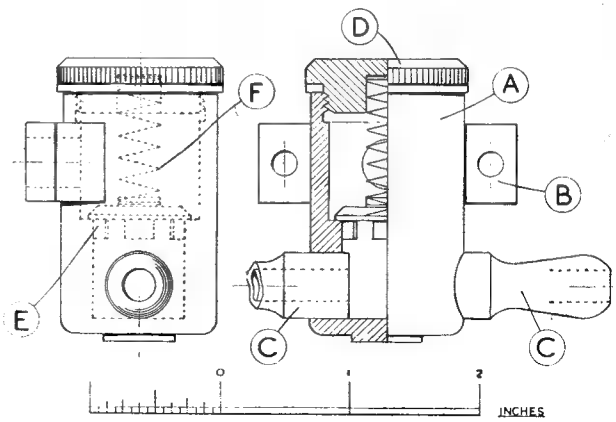


Fig. 11. Details of the relief valve

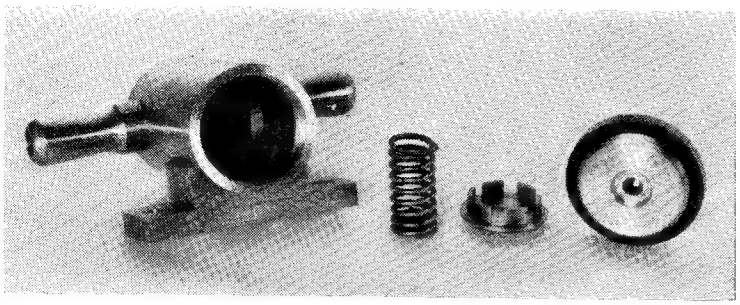


Fig. 12. *The components of the relief valve*

The Shaft Coupling—Fig. 7

Although the muff coupling shown in Fig. 5 can be used, a spring coupling is easily fitted, and provides an efficient and flexible form of drive.

A small motor-cycle valve spring will serve well for this purpose, and two collars are required for attaching the spring to the ends of the shafts. If the direction of the drive tends to close the spring coils, this alone will usually give a sufficient hold, but it is safer to anchor the ends of the spring by means of grub-screws placed between the coils, the same screw will also serve to secure the collar to the shaft.

To complete the unit and make it ready for service, some additional fittings are required for connecting up to the pipe-line, as well as for filtering the fluid and regulating the output.

The Pipe Connectors—Fig. 8

For connecting the pump, both the inlet and outlet passages are furnished with a screwed-in nozzle to take either rubber or plastic tubing. The bore of the nozzle should be made as large as possible, so as not to restrict the flow of the circulating fluid.

The Filter—Fig. 9

Where the liquid circulated by the pump is liable to contain particles of foreign matter, it is essential to fit an efficient filter in order to protect the working parts of the pump from damage. For example, cutting oil used in lathe work will carry metal swarf, which must be removed before reaching the pump. The filter illustrated has an inner, fenestrated cage *B* provided with a flange for soldering into the main reservoir. The cage *D*, forming the actual filter, consists of two end-collars soldered to a cylinder of perforated zinc *C*, and outside this, also soldered in place, is a wrapping of fine-mesh wire gauze. The filter casing *A*, made from ■ length of brass tube, slips over the inner cage *B* and the bottom plate makes a tight joint against a fibre ring-washer.

The nozzle for the connecting tubing is silver-soldered in place in the wall of the casing. The recessed cover plate *E* is also fitted with a fibre washer, so that when the screw *G* is tightened, the joint is sealed. The spring *F* serves to press the gauze cage against the bottom plate of the casing, in order to make a tight joint. A filter of this pattern is not easily clogged, as it has a large filtering area and, moreover, it can be very easily dismantled for periodic cleaning.

As shown in Fig. 10, the inner cage *B* can readily be drilled in the lathe after the fitting has been turned to shape.

The flanged end of the part is gripped in the chuck, and a stud, screwed into the other end, is supported in the tailstock drill chuck by closing the jaws to afford a running fit.

The small drilling spindle, described in a previous article is mounted on the pillar of the back toolpost so that it can be driven from the lathe overhead. For the actual drilling, it is best to use ■ $\frac{1}{8}$ in. diameter centre-drill, as the small pilot point will readily enter the curved surface, and the drill can then be fed in to form a hole equal in diameter to that of the drill shank.

The Relief Valve—Fig. 11

If the output of the pump is throttled, when for example, reducing the supply of cutting fluid fed to a lathe tool, the pump rotor is liable to churn the circulating fluid and cause frothing. To prevent this, it is advisable to fit a by-pass or relief valve, so that, according to the spring pressure on the valve itself, ■ greater or less volume of liquid will be delivered at the output nozzle and the remainder will be returned back to the reservoir.

The body *A*, machined from the solid, is silver-soldered to the base *B* which is drilled to provide a passage for the fluid escaping past the spring-controlled valve *E*. If required, the spring can be fitted with a screw for adjusting the spring tension to suit fluids of different viscosity.

The body is cross-drilled for the two nozzles, in the same way as the gudgeon-pin housings are machined in a piston.

An alternative form of relief valve is shown in Fig. 13. Here, there is no additional back pressure in the valve itself, for the combined area of the outlet and by-pass ports always remains at least equal to that of the inlet in any position of the cylindrical shutter. In this way the fluid stream is merely split up between the outlet and overflow ports, and the flow is but little affected by any variation of the viscosity of the circulating fluid.

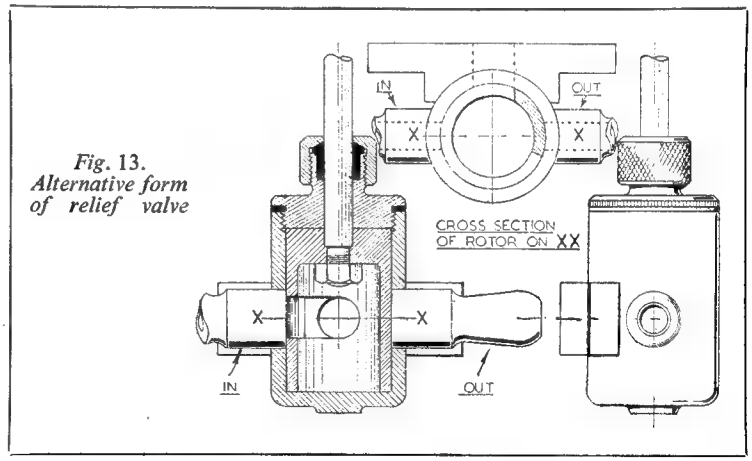
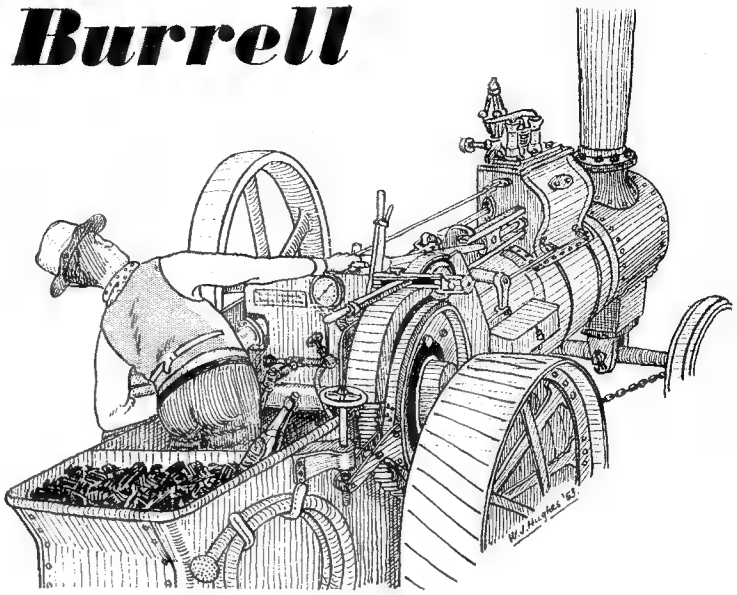


Fig. 13. *Alternative form of relief valve*

The Old Burrell

RURAL FICTION FOUNDED ON RURAL FACT

By "Counter-Shaft"



—sighted along the hind-wheel

TIMOTHY WILLYS lived at Sloothby, a small village in the Fens bounded on the west by the Lincolnshire Wolds and on the east by fenland and then the grey North Sea.

At twenty-five he decided farm labouring had little to offer and by keeping his mind and eyes open he conceived the idea of joining the threshing business. But how? Although his worldly wealth was but forty-five pounds, sales of such plant were fairly frequent, and he attended many before he found what he sought, to wit, a threshing drum, old, but not beyond repair. What might it fetch? thought he as he inspected it, outwardly callous just prior to the sale. He had not long to wait, as it was an early lot.

"Well, gentlemen," intoned the auctioneer, standing on the platform of his little portable rostrum, the desk portion steadying him as he rested part of his abdomen against it: "What am I bid for Lot No. 61? A threshing drum by Garretts. Fifty-four inch, in good order. Five pounds, thank you." And so on, until after a long pause, "forty-two ten" from Willys in a low voice. Another long pause, until seeing no further bid was forthcoming, the auctioneer dropped his hammer.

Willys managed to get a tow behind a traction engine which had also been sold that day, and was being driven by its new owner past his mother's cottage, and the old thresher came at last to rest in a piece of garden used by his mother as a drying ground for the weekly wash.

"That's what you've been up to, is it?" enquired his mother. "And what will you do with it?"

"Make it go," announced Timothy, "it only wants a little detailed attention and some new beater bars and a coat of red paint."

"Nothing else?" asked his mother. Timothy refrained from replying.

Now Willys was a natural mechanic, to whom the use of tools just "came," and it was not many weeks before his old drum was as near to being new again as it would ever be.

Then came the great question—with what to drive it? By an engine, of course. Where from, and where was the money to buy it? However, nothing daunted, Timothy approached his old master, and enquired if he would hire his drum for the coming season. The farmer, still a trifle sore that Willys had left him, but secretly admiring his enterprise, said he would help him, and so for the rest of the year Timothy's drum went from field to field powered by his master's old tractor—hardly man enough for the job. After the season the farmer paid up, and Willys put £82 to spare in his cash box.

The Auction

Still no engine of his own, but there were often sales, and one at Claxby Pluckacre promised the disposal of nine tractions of all makes and sizes, including one old Burrell which had seen much service during the thirty-five years since it left the works of its birth. It was to be sold early in the sale, after a few odd lots were disposed of, and so Timothy had not long to wait.

"Lot 19," intoned the auctioneer. "One Burrell single-cylinder traction engine. Maker's number 1004. Perfect. What may I say?"

"Where's the last boiler report?" shouted Willys from the back. "You can't say its perfect if the boiler's gone."

The auctioneer paused a moment looking somewhat pained, and then had a few hurried whispers with his clerk. "I'm sorry we haven't it here," he replied at length, "but I'm told the boiler's all right."

"So you say," vociferated a derisive voice at the back.

"One pound," from someone.

"Tew," from another.

"Five," said a scrap dealer.

"Seven," countered his competitor among the crowd, not at all remarkable looking, with no collar, string for bootlaces and three-sixteenths of stubble on his chin.

Willys nodded his head. "Eight I'm bid," said the auctioneer; "come, gentlemen, we've got a lot to get through. Any advance on eight?"

"Nine," shouted the first scrap man, who even boasted a greasy cap.

"Ten," muttered his opposite number.

"Eleven," from Willys.

"Come on gentlemen, I'm bid eleven," recited the auctioneer appearing a trifle weary. "Eleven, going at eleven—Gone! Sold to T. Willys for £11," intoned the auctioneer to his clerk.

Willys moved over to pay the clerk, and then away to gloat over his prize, smiling to himself that his little ruse had worked; for had not the boiler inspector himself, in

return for a traction engine catalogue Willys had given him, and which he badly wanted, told him there was nothing fundamentally wrong with it ?

There it was—his now—at the beginning of the long row of nine engines; all with a little steam up, and a wisp of smoke rising from each chimney. How resplendent looked some of the others, so polished, so clean and so massive.

" Might as well get going now," murmured Timothy to himself as he climbed on to the manstand and surveyed the motion. The gauge showed 75 pounds of steam, so he soon had the blower going and the fire attended to. At 120 pounds he shifted the low speed pinion into gear with the spur-ring and, upon gently touching the regulator open, the old Burrell moved forward describing a long arc on the sale ground towards the narrow gated exit.

The constricted approach was churned inches deep in semi-glutinous mud, extending fanwise from the gateway to the deep boundary ditches on each flank. " Hum," thought Timothy " If I don't get square with the gateway she'll slither sideways."

Approaching the exit slowly and carefully, he sighted along the outer edge of the near-side rear wheel, thus making sure it was in line with the left hand gatepost. Gently does it in these cases, and with the large flywheel just ticking over, and the top of the expansion link nodding to and fro in synchronised approval, his nine tons of engine passed slowly, but surely on to the metalled cart track leading from the gateway.

Having got out successfully, Timothy stopped to check over his engine and sample his " elevenses," accompanied by cold tea from a bottle which, in its pristine glory, had contained a pint of Spalding best mild. This finished, he returned to the saleground, where the last of the remaining eight engines was just being sold.

" Hundred and twenty I'm bid for this excellent engine—your last chance to get a cheap engine," came the voice of the auctioneer which showed no signs of tiring.

" Hundred and thirty," from a farmer near Pode Hole.

" One hundred and thirty. One hundred and thirty. Now gents, any advance on one hundred and thirty. One hundred and thirty—Gone ! "

" That's that," thought Willys to himself; " soon the fun will start."

Now that the engines and drums were all sold the main interest in the sale seemed to have evaporated, and clusters of onlookers formed round the engines now in the hands of their new owners or their drivers.

First to move was a large Fowler compound, complete with canopy and brass-edged motion plates, which described a majestic arc towards the centre of the field leaving a track of disrupted sods to show its course. Close behind came a little Wallis & Steevens tractor, now owned by a proud haulier from Osgodby, and the start of these two seemed to be a signal for the rest to commence moving at once; the exodus towards the gateway developed into a kind of unofficial race, with the heavy Fowler soon overhauled by the faster Wallis which, in turn, found itself chased by a six horse-power Foster, formerly a showman's engine and used to knocking up eight miles per hour. Then, from the far end of what was now a depleted line, came sharp blasts of a well-tuned exhaust from an Aveling & Porter convertible engine which could be used as a traction or roller, as desired, by using the appropriate set of wheels or rolls provided. A thoughtful-looking old Savage with a large firebox standing nearest to the gateway, seeing his opportunity, started off with a cascade of sparks from his stovepipe chimney.

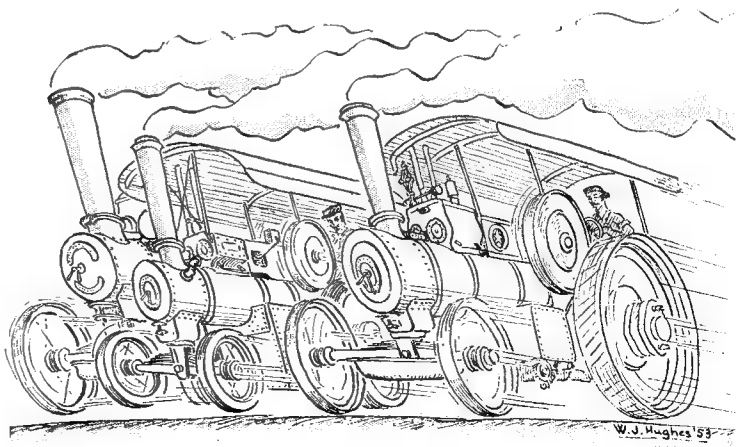
By now the three remaining engines, one a Marshall light compound with radial valve-gear, another a heavy old Garrett with a patent firebox crown, the third being a " Little Giant " tractor by Tasker's of Andover, renowned for its sturdiness and with safety-valves placed athwartwise across the cylinder block, were on the move, now in the hands of strangers very inquisitive to see what they would do.

What a sight ! Eight engines of all sorts and sizes rumbling and lurching along on the soggy soil. The Foster had an organ whistle, relic of its showland days, and broadcast syrenic whoops as it strove to overtake the Fowler and the Wallis; converging on the three leaders was a galaxy of polished boilers, whirring flywheels, squirting injector overflows and " chuff and dufter " noises from eight distinctive chimneys erect like stub lances held aloft and all emitting a pungent sable-silvered exhaust.

The Foster arrived at the gateway first, but in passing the Wallis, it just touched the latter's offside front wheel, enough to slew it round a trifle in the thick mud. The former stopped at the gateway, only to be hit a glancing blow almost immediately afterwards by the Wallis as it came to rest. Both drivers found themselves therefore at a slight angle to the gateway with their rear hemmed in by the large Fowler, and further away still were the rest of the field, some with safety-valves roaring and all with their wheel rims cased with glutinous sods of turf.

The driver of the Marshall at the rear pulled his link into full back gear and upon reversing, his rear wheels just revolved slowly without moving the tractor; and when he stopped, the natural surface of the terrain formed a short chord across the bottom of the steel-straked driving wheels.

" Ars a rummun," mused the



A kind of unofficial race

Norfolk-born driver of the Savage, " they kint meuve as they are loike this."

At this moment, Willys joined the throng that was collected, and surveyed the scene from the ground.

" You'll have to get square between the posts afore you start," shouted Willys to the Foster's new owner-driver, which provoked a flood of denunciation relating to what he thought of the gateway, the field and things in general.

" I could wind you round I think," replied Willys.

" All right, let's have your rope, young man," came the answer.

Timothy went to his old Burrell, placed a large chunk of fallen timber behind each rear wheel to skotch the engine, untied the end of the wire rope on the winding drum between the near-side driving wheel and the hornplate, and walked slowly towards the Foster with the rope over his shoulder, the driving-pin hole in the revolving drum winking cheerfully, it seemed, as it rotated behind the stationary spokes of the rear wheel. Making fast the eyed end of the rope to the centre of the Foster's front axle, Timothy returned to his Burrell, put the slow speed pinion in mesh with the spur-ring and patted open the regulator, whereupon the forged crank started to revolve, at first taking up the slack in the rope; this done, a little more steam when the catenary of the rope resolved itself into a straight line as the load was taken up. A few deep-throated chuffs from the Burrell's exhaust, and the Foster's front end was square with the gateway, after which it was drawn through it and up the lane a few yards close to the Burrell's tender.

Rural Cunning

Timothy climbed down and unbended the end of his rope off the Foster.

" Never thought you'd come out like that," came from the local policeman complete with bicycle, who had put in an appearance, not so much because his presence might be required, but because he was only human after all, and rather liked the atmosphere of a saleground.

" No," said the Foster driver a little nonplussed as it seemed.

" I think that's worth a couple of quid," remarked Willys, " you might have been there for the rest o' the week, you know, if I hadn't been here."

" Not on my life," retorted the other, " two quid for one pull. I'm damned."

" Right," said Willys quite unperturbed, " here I stop until you agree to pay. No money—no move." With which remark, he mounted the man-stand of the Burrell and started on the remainder of his elevenses.

The Foster's man watched the methodical and determined movement of Timothy's jaws, and realised the delicacy of his position, not improved perhaps by the other enginemen who had by now come along to see what the stoppage was about.

The first scrap man even boasted a greasy cap

The policeman seated his stern on the crossbar of his cycle, and thus partially strutted in position, folded his arms and smiled. It was a change to be not officially involved.

" Orl right, orl right, tew quid then," grumbled the other.

" Agreed," answered Willys, and added in a calm voice, " don't forget we have witness of the bargain," nodding towards the officer.

Out went the Burrell into the main road, followed by the Foster, and when the latter was clear Willys backed the Burrell into the lane again.

The Fowler's front wheels were nicely bogged nine inches deep. Willys walked up with the rope. " Two quid to get you out," he said with a smile to the owner who advanced to meet him.

" I suppose I shall have to pay," the latter replied, " or stop where I am," showing a vestige of a smile.

Another pull and the Fowler was slewed bodily through the mud until it too was square with the gateway, when through it went.

The Wallis driver now decided to move on his own account, but desisted when the rear of the tractor slithered sideways towards the ditch and he, sighing heavily, resigned himself to paying two pounds.

After the Wallis came the turn of the Aveling and Porter, but the grave old Savage, who had tried to extricate himself by turning round in the limited space, was hauled out backwards, and being rather wide and not quite square with the gateway, one axle cap chased a groove in one gatepost as it came through.

Next was the turn of the Marshall, followed by the heavy Garrett, which sank so low in the approach to the gateway that his ashpan ploughed a furrow in the mud, accompanied by staccato beats from the Burrell's exhaust, which shot numerous sparks from its chimney over the tops of several trees.

Lastly came the Little Giant, looking admittedly rather little after the larger Garrett, and with a wisp of steam coiling upwards from the two polished brass safety-valve pipes.

Eventually, all the engines were out on the main road, the copper dutifully regulating such traffic as there was past them.

Rather " Tricky "

The situation now became a trifle delicate, because the owners and drivers concerned, with their new acquisitions now safely out of any difficulties, felt a little less like paying up. Willys had an idea. A short distance away along the road was a comfortable hostelry " The Gate," its sign a small hanging gate painted white bearing the legend:

" This gate hang high and hinder none
Refresh and pay and travel on,"

in neat black letters.

" What about one ? " shouted Willys to the group of enginemen who had collected round the silent old Savage, as he started off towards " The Gate." Arrived outside, he called their attention to the last line. " Don't forget the ' pay,' blokes," he said, at the same moment taking off his old greasy bandless trilby and holding it out. They took the hint, and accompanied by grunts, guffaws and grumbles, sixteen pounds in grimy notes and well worn silver fell into the hat.

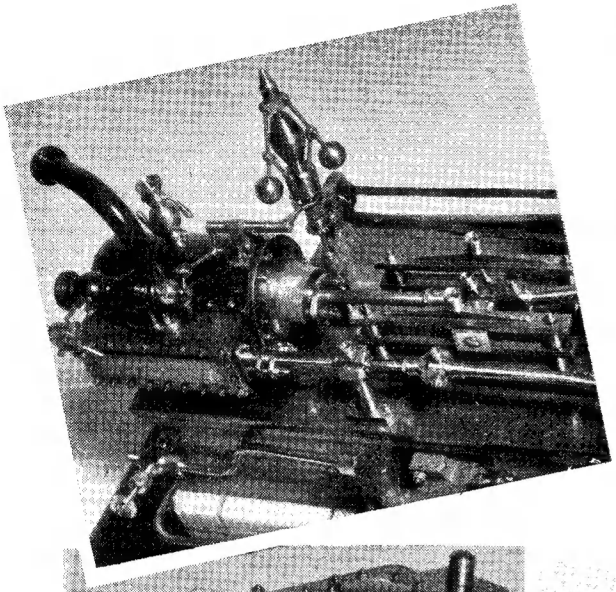
Willys carried it inside and ordered nine pints of Spalding best mild, thinking as he did so, " and the old girl only cost me eleven pounds ! " Nine gleaming tankards soon appeared on the small counter and nine were soon raised to nine grimy mouths.

" Good health, gents," quoth Willys, " here's to the old Burrell."

" Aye, aye," assented the others, " The Old Burrell ! ! "

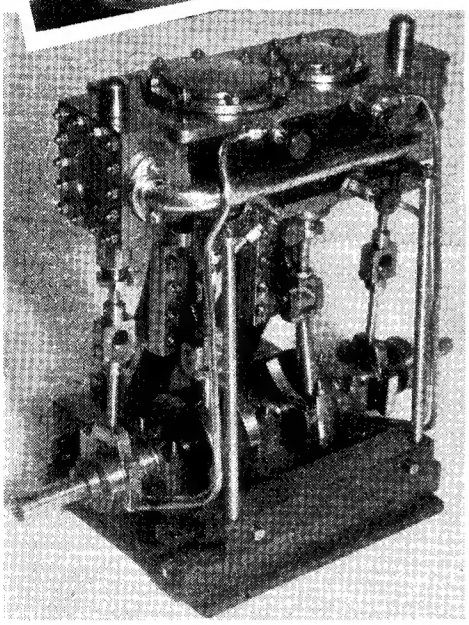
Keighley Club's Exhibition

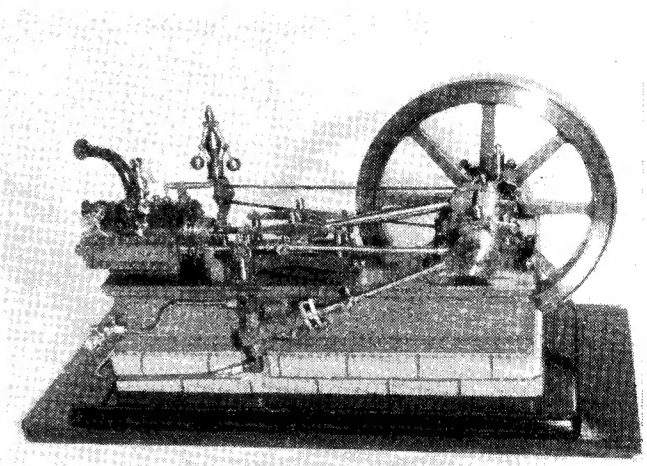
Photographed by "Northerner"



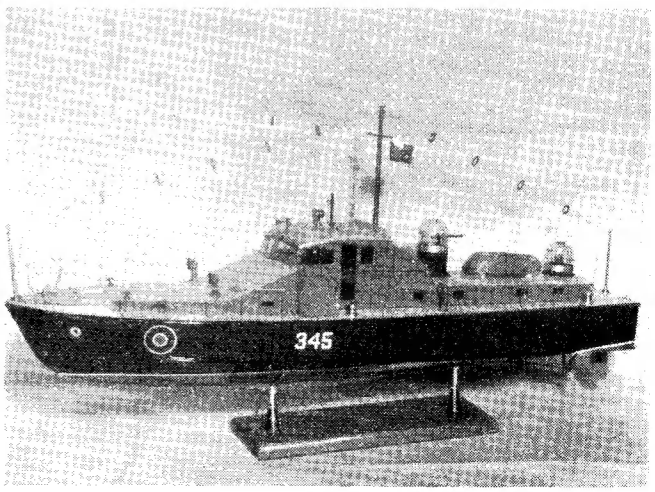
Below: This excellent free-lance mill-engine, built by C. Maude, after much study of the subject, was very representative of the prototype, both in detail and appearance. The builder made his own patterns—in fact, the bevel gears and a few studs and nuts are the only purchased parts. The model had a bore and stroke of 1¼in. by 1½-in., and was awarded a First-Class Diploma.

Left: Close-up of motion work of the mill engine Points to note which add to the realism of the model are plenty of studs on valve- and cylinder-covers the Porter governor and gear, the correct big-end the valve-guide and slide-bars, and the "bellied" connecting-rod.





Above: Another engine designed and built by C. Maude is this compound marine-engine, of ¾-in. and 1¼-in. bore by ¾-in stroke It is to be fitted with full Stephenson reversing-gear, and with condenser, air-pump and feed-pump—there will also be a steam-pump. The engine is to power a scaled-up version of the tug "Gondia," of 51-in. length and 12-in. beam, and will be steamed by a Scotch boiler 7-in. by 7-in., with float controlled water-feed.



Right: An excellent ½-in. scale Walton "Thames" Air/Sea Rescue Launch was exhibited by A. Whiteley. Like several A.S.R.L.'s seen previously at Huddersfield, this boat had fittings built as described by W. J. Hughes in *THE MODEL ENGINEER* some time ago. It is fitted with a commercial diesel engine. The vessel is to be radio-controlled.

QUERIES AND REPLIES

"THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked "Query" and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Machining Phosphor Bronze

I am experiencing great difficulty in machining phosphor-bronze castings, particularly in respect of drilling and reaming operations, as the work heats up and seizes on the tool. The use of lubricants does not seem to help very much. Can you give me any advice on this matter?

H.P. (Aberdare).

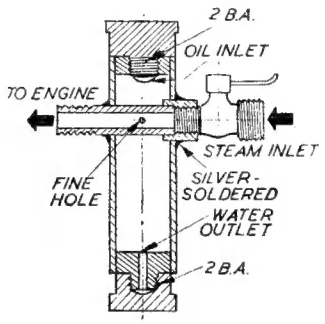
There are several varieties of phosphor bronze, some of which are much easier to machine than others. For the tougher grades, modern industry favours the use of tungsten carbide or diamond tipped tools, but good work can be done with high-speed or even carbon steel tools if more moderate production rates are permissible. With all bronzes, it is essential to keep the tools keen, as any dullness is sure to cause excessive heating; top rake is not generally desirable as it tends to make the tools snatch and dig in; hence straight fluted drills are usually better than twist drills for use on this material. High cutting speeds, with moderate feed, are recommended, except for reaming, where low speed with fast traverse is usually preferable. If high rates of production are necessary, a copious supply of rather thin soluble oil emulsion (suds), on the outside of the work, acting more as a coolant than a lubricant, may be found helpful.

Displacement Lubricator

Could you kindly give me instructions for making a displacement lubricator for a small steam engine $\frac{3}{4}$ in. bore by 1 in. stroke; also, please inform me if the lubricator is fitted in the steam supply pipe-line.

S.C. (Braintree).

The displacement type of lubricator consists simply of a closed vessel in communication with the steam pipe-line and fitted with some means of both filling and draining. In some cases also, a valve is provided for isolating the vessel from the steam pipe-line, and this provision is necessary when the engine is run for long continuous periods, and can also be used as a means of controlling the rate of oil feed, but is not usually necessary on small engines running for short periods.



The sketch shows a simply made type of lubricator which can be fabricated from brass tube and rod by silver-soldering. This type of lubricator relies to some extent on condensation of a small quantity of steam in the pipe-line, and, therefore, is most effective on saturated steam. It may possibly be found to work erratically or not at all if the steam is superheated. In the normal way, the steam condensed in the pipe-line tends to sink to the bottom of the lubricator, thereby displacing oil, which is fed into the pipe-line for lubricating the internal parts of the engine.

Screw-cutting Indicator

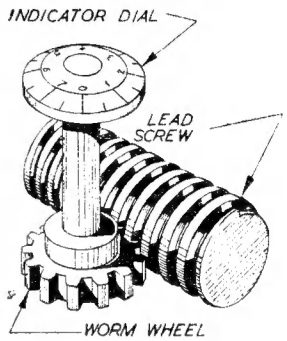
I wish to make a thread dial indicator for my 6 in. lathe, the leadscrew of which is 6 t.p.i. Can you please tell me the size (i.e. number of teeth) of the gear, and also where it is possible to obtain same?

R.A. (Cockernhoe).

This device consists of a worm-gear which will mesh into the leadscrew, and having a dial attached to its spindle on which the graduations are marked.

The worm wheel must have a number of teeth which is a multiple of the number of threads per inch in the leadscrew, that is to say, 12, 18 or 24 teeth for a 6 t.p.i leadscrew.

Twelve teeth will give two positions in which any whole number of threads can be engaged, 18 teeth



will give three positions and 24 teeth will give four positions.

We cannot inform you where a suitable gear for this purpose can be obtained, but it would not be a very difficult thing to make by milling or planing the teeth in the lathe, as the exact tooth form is not highly important, so long as the pitch is fairly accurate.

Scale Conversion

I wish to know the method of scaling a $3\frac{1}{2}$-in. gauge locomotive up to 5-in. gauge, and what would the scale be on 5-in. gauge? I have nearly completed a $3\frac{1}{2}$-in. gauge engine and now wish to build the same thing for 5 in. gauge.

L.C. (Ashford).

To convert $3\frac{1}{2}$-in. gauge dimensions to 5-in. gauge, multiply each by 10 and divide by 7. The generally-accepted scale for 5-in. gauge is $1\frac{1}{16}$ in. to the foot.

We would add, however, that you can easily avoid the rather nasty-looking calculations given above, by making up a simple proportional divider with its legs $8\frac{1}{2}$-in. long and its pivot at 5 in. This will give you a simple kind of "scissors" with its two pairs of arms, one each side of the pivot, divided in the ratio of 7 to 10. Measure the $3\frac{1}{2}$-in. gauge drawing by means of the shorter arms, and every measurement made in this way is reproduced at the other end of the "scissors" arms exactly the right size for 5-in. gauge. No calculations wanted; therefore, no bother!

READERS' LETTERS

● **Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.**

MOLE DRAINING

DEAR SIR,—With reference to Mr. G. F. A. Gilbert's letter in THE MODEL ENGINEER, dated November 5th, 1953, on the subject of mole draining, he will probably be surprised to learn that the method I described, of threading drain-pipes on a tail-rope, and laying them behind a mole-drainer, was practised more than a century ago !

It was, in fact, John Fowler's original method, and was first used commercially by him, with a horse-driven windlass to supply the motive power, in draining Hainault Forest, Essex, which he contracted to do in 1850.

In the Illustrated Catalogue of the Great Exhibition of 1851, Vol. 1, page 367, there is an excellent illustration and description of the method, again with a horse windlass. The rope on which the pipes were strung was in fifty-foot lengths for the sake of convenience, and on completion of the drain, was unhooked from the plug or mole, and pulled out backwards.

It is stated the length of drain could be anything up to 225 yards, and that not more than fifteen minutes need elapse between finishing one drain and starting the next. In common clay land, when the depth did not exceed 3 ft., four horses would complete between 6,000 and 7,000 ft. of drain in one day. Drains could, however, be laid at a depth of more than 4 ft., if required; naturally at a slower rate. This apparatus was built for Fowler by Ransomes', by the way.

It was following this, of course, that Fowler developed the use of steam power, still working with Ransomes, for at that time he had no factory of his own. In my notes I find a transcript from Vol. XX of the journal of the Royal Agricultural Society of England, describing how at the Lincoln meeting of 1854, Fowler's draining plough was subjected to severe trial, and laid tiles (i.e. drainpipes) with admirable precision, as was proved by opening the drain in several places.

The motive power now was a portable engine, with a frame carrying a special windlass for haulage, having two winding drums, the smaller of which was used for hauling the plough back. The engine was anchored in one corner of the field, and haulage was done by way of pulleys, snatch-blocks, and anchors.

Incidentally, this subject proves how difficult is the task of the historian, for in " Ransomes' Royal Records," published by that firm to celebrate their centenary in 1939, it is stated that the portable steam engine was used by Fowler for mole draining as early as 1850, whereas in the " Transactions of the Society of Engineers " for 1868, the date of his first use of steam power is given as 1852.

Personally, I incline to the latter date: (*a*) because it was published nearer to the period; (*b*) because I feel sure that if steam had been used in 1850, the apparatus would have been at the Great Exhibition in the following year; and (*c*) because there is other evidence, which I have not room to detail here, to bear out the suggestion.

Finally (because this letter *could* run on indefinitely !), may I remind you that in the same issue in which Mr. Gilbert's letter appears, I *have* mentioned (p. 559) that drain pipes would not be used in certain soils ?

Yours faithfully,

Sheffield. W. J. HUGHES.

OUTDOOR TRACKS

DEAR SIR,—The Orpington Model Engineering Society is thinking of building a permanent track in a local park, for which permission has been granted by the authorities. The track will be made of concrete arches, about 6 ft. long, standing on concrete stools. Three gauges, 5 in., 3½ in. and 2½ in. will be provided, the rails being made of strip steel and fixed to the top of the concrete arches.

I would very much like to obtain advice from other clubs who have erected similar tracks. Doubtless, there are many pitfalls which could be avoided by experience, and the benefit of this experience is what I am anxious to obtain. The proposed shape of the track is an ellipse, having diameters of 300 ft. and 100 ft.

As we shall have to put the making of the arches out to contract, I should be glad if anyone could give the names of firms willing to undertake such work. As to cost, we have agreed to put up the sum of £150, and I should like to know if this is a reasonable sum in the light of present prices. The members would erect the pre-cast parts, and would lay the rails on the top. As a last query, what is the best rail section and the method of fixing ?

Yours faithfully,

Orpington. HAYDN D. SMITH.

PETROL ENGINE DESIGN

DEAR SIR,—" Northerner " reports in your November 5th issue, that the twin 10 c.c. water-cooled petrol engine, designed by Mr. Riley, has won the second prize in its class at the Southport Exhibition. The two interested friends who are building this engine, may also be interested to know, that I, and many others, who have never known or had communication with Mr. Riley, or his design, have made exactly similar engines.

This strange coincidence is so fantastic, that I am sure " Northerner " must be in ignorance of Mr. E. T. Westbury's " Seagull " engine design.

Yours faithfully,

Liverpool. L. ROBERTS.

THE SURFACE TREATMENT OF METALS

DEAR SIR,—The article in the November 5th issue of THE MODEL ENGINEER by C. G. Green on this subject, interested me greatly, but Mr. Green made no comment on one aspect that is giving me considerable thought at the moment. That is, the treatment of brass and copper.

I have some very light complicated structures fabricated from brass and copper sections, silver-soldered and soft-soldered together. On completion I find that quite an amount of light scale, verdigris and discoloration has formed in consequence of the soldering operation. Is there any solution available that will remove this, in preparation for finishing with cellulose ?

Mr. Green's or any other reader's advice on this matter would be very greatly appreciated.

Yours faithfully,

Dagenham. L. GURNEY.